MODIFYING THE SOUTH AFRICAN MINING ROYALTY REGIME FOR OPTIMAL MINERAL RESOURCE USE AND MANAGEMENT OF MINERAL RENTS.

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DECLARATION

I declare that this thesis is my own unaided work. It is being submitted for the degree of Doctor of Philosophy in Engineering at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

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ABSTRACT

The re-emergence of Resource Nationalism (RN) arising from the perception of the non-receipt of adequate economic benefits from mineral development, the evolving subject of sustainable development, declining performance of commodity prices and their volatility thereof, coupled with the declining terms of trade for raw minerals in comparison to refined mineral products in recent years, have caused governments of mineral-rich States to begin re-assessing policy changes on mineral development in their States. These issues have made many of these governments realize that concentrating on one highly volatile sector can have detrimental effects on their steady economic development. Hence, many of local governments are pushing for more optimal mineral use and management of mineral rents that will result in more economic linkages from their non-renewable resources sector to other economic sectors. This drive for economic diversification, which would reduce the exposure of mineral economies to mineral price volatility presents a more pragmatic long-term approach to facilitating national economic development of their States.

Hitherto, many of these governments are exploring the use of various policy instruments (such as fiscal instruments) to foster such resource-based economic linkages to stimulate industrial and economic growth and development. South Africa is a case in point, with her government putting in place such resource-based economic diversification policies. One of such policy instruments is the Mineral and Petroleum Resources Royalty Act (MPRRA), which was enacted in 2008. Apart from the compensatory revenue-collection objective of this instrument, its formula provisions also allow for a reduction of the royalty rate for refined minerals. This allowance is for the purpose of aligning the mineral sector with the government's objective of promoting local beneficiation of South Africa's minerals for maximum economic benefit.

The results of a previous study that was carried out to assess the effectiveness of this instrument in realizing the beneficiation objective of the MPRRA using the platinum sector as a case study, led to the need for this current study. The previous study found that platinum miners were unlikely to become refiners based on the current parameters/provisions of the MPRRA. Hence, to further investigate this result, it was deemed important to extend the study to other commodity sectors to ascertain the

effectiveness of the MPRRA's beneficiation objective before proposing a way-forward i.e. tweaking the parameters of the royalty regime to facilitate the achievement of SA's policy objectives. The purpose of this research was to assess the major mineral producers in SA, in order to propose improvements to the current royalty system. Four major commodity sectors (Gold, Platinum, Iron and Coal sub-sectors) were selected to facilitate the investigation of this study. To realize the purpose of this study, the methodology used involved econometric analysis carried out in two phases, which used models created through IBM SPSS Statistics and Microsoft Excel software.

From the econometric evaluations, five different policy options (econometric models) were proposed for tweaking the royalty formulae. After testing these different policy options, the deductions obtained from the five models were compared against each other and two main beneficial options for the government were realized. The most desirable option (Model 2) was tweaking the X-factor of the current royalty formula for Refined minerals (See Cawood (2010)) and its F-factor. Hitherto, Model 2's parameters specifies that: R% = 0.5% + $(\frac{30}{F})\%$; Where, maximum profitability ratio (X-factor) is changed from 56.3% (~ 60%) to 30%, and F-factor for refined minerals is changed from 12.5 to 12. This will result in the minimum and maximum royalty rates to be fixed at 0.5% and 3% respectively.

In this era where SA government is highly concerned with achieving more mineral beneficiation locally, Model 2 (referred to as "**Ideal Beneficiation model**") was recommended to be the most optimal. With the Ideal Beneficiation model, SA government had the potential of actually achieving a win-win situation if it planned on keeping all three main objectives of the MPRRA. The outplay of how this policy option can be used is outlined in a proposed implementation plan in this study.

DEDICATION

This research is dedicated first and foremost to God. Words are not enough to express my immense gratitude to Him for enabling me to accomplish yet another milestone in my life’s pursuits.

I also dedicate this research to my husband – Samuel, my children – Olivia and Salem Akinseye. I love and appreciate you all for giving me sound support while I studied for this degree and enduring my divided attention between you, work and my studies. I also dedicate this research to my parents - Engr. and Mrs. Oshokoya. I am also very grateful to you both for your all-round facilitation of my life’s journey.

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ACRONYMS

AMPLATS	Anglo American Platinum Limited
AMTS	Advanced Manufacturing Technology Strategy
ANC	African National Congress
APT	Additional Profits Tax
BBSEE	Broad-Based Socio-Economic Empowerment
BEE	Black Economic Empowerment
BIC	Bushveld Igneous Complex
BRIC	Brazil, Russia, India, China
CAPEX	Capital expenditure
CIF	competitive Investment Framework
CIT	Corporate Income Tax
CoM	Chamber of Mines
COSATU	Congress of South African Trade Unions
CSIR	Council for Scientific and Industrial Research
CSR	Corporate Social Responsibility
DoE	Department of Energy
DMR	Department of Mineral Resources
DST	Department of Science and Technology
DTI	Department of Trade and Industry
EBIT	Earnings before interest and taxes
EDD	Economic Development Department
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IDC	Industrial Development Corporation
IMF	International Monetary Fund
IPAP	Industrial Policy Action Plan
IRP	Integrated Resource Plan
Iscor	Iron and Steel Corporation of South Africa
ITA	Income Tax Act 1962
ITAA	Income Tax Administration Act
JV	Joint venture
LDCs	Least developed countries

MIP	Manufacturing Investment Programme
MITI	Ministry of Trade and Industry
MNCs	Multinational companies
MPs	Members of Parliament
MPRDA	Mineral and Petroleum Resources Development Act 2002
MPRRA	Mineral and Petroleum Resources Royalty Act 2008
MPRRB	Mineral and Petroleum Resources Royalty Bill
MTBPS	Medium Budget Policy Statement
MVS	Mineral Value-Chains Strategy
NA	National Assembly
NDP	National Development plan
NGOs	Non-profit government organizations
NGP	New Growth Path
NIPF	National Industrial Policy Framework
NORDIC Countries	Denmark, Finland, Iceland, Norway and Sweden, including their associated territories (Greenland, the Faroe Islands and the Åland Islands)
NPC	National Planning Commission
NSONR	National Sovereignty over Natural Resources
NSR	Net Smelter return
NT	National Treasury
NUMSA	National Union of Metal Workers of South Africa
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries
Opex	Operating expenditure (costs)
PGMs	Platinum Group Metals
PMA	Precious Metals Act No.37 of 2005
RDP	Reconstruction and Development Programme
RN	Resource Nationalism
RRT	Resource Rent Tax
SA	South Africa
SARS	South African Revenue Service
SIMS	State Intervention in the Mineral Sector
SIPs	Strategic Integrated Projects

SMMEs	Small and Medium-scale Enterprises
SOMEs	State-owned Mining Enterprises
S & R	Smelting and Refining
SSA	Sub-Saharan Africa
Stats SA	Statistics South Africa
SWF	Sovereign Wealth Fund
TNCs	Transnational companies
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
WA	Western Australia
w.r.t.	With respect to
Yr	Royalty rate
ZAR	South African Rand

CHAPTER ONE

RESEARCH BACKGROUND AND AIMS OF RESEARCH

1.1 INTRODUCTION

In many developing mineral-rich countries, their mineral endowments occupy a central role of their existence. This is as a result of the economic significance and potential of mineral resources to contribute directly and indirectly to national economic development through the generation of income for its host government, which are used to fund education, health care, roads, electric-power supplies, and other forms of infrastructure. Mineral resources potentially provide sources of livelihood to local communities - employment, purchasing of locally produced goods and services, community investment, and training etc., as well as serve as a base for downstream processing and manufacturing industries, by providing essential raw materials needed to facilitate the assembly of new ones (such as in mobile phones etc.) (Avalaresources, 2017; Eggert, 2001). In more recent years, mineral endowments have and are being used to promote a more efficient use of energy; and stimulate environmental awareness through rehabilitation programs that lead to the generation of more renewable sources (Avalaresources, 2017).

Nevertheless, despite the wealth-generation potential of their naturally endowed lands, and the generally accepted notion that it is fair for governments and citizens to share in this wealth, there is still growing clamour by the citizens of mineral-rich societies that they see little or no evidence of such benefit. Currently, with the evolving subject of sustainable development, linked with perceived inadequate economic benefit despite commodities price boom, this has led to the re-emergence of an old issue – Resource Nationalism (RN). In the name of RN, it is now widely expected that the primary purpose of mining, like all other forms of economic activity, should therefore not only focus on creating wealth for the satisfaction of human needs, but also to ultimately contribute to social welfare.

Realization of benefits from mineral endowments can be achieved from a whole range of activities which mineral production comprises of. These include:

- Mineral extraction and exportation with minimal local processing;
- Formal, semi-formal job creation;
- Initiation of processing and export activities, in which import substitution is started, with local production of some inputs and equipment;
- Generation of foreign exchange earnings from exportation of goods and inflow of revenue (and resource rents) from mining royalties and taxes into the government's fiscus;
- Clustering of industries engaged in the exportation of some of the locally produced goods and services that were originally manufactured for import substitution purpose; and finally,
- Local manufacturing of all types of goods and services and exportation thereof (Singh and Evans, 2009).

In the context of RN, in order for these economies to realize sustained economic and social development from the exploitation of mineral resources (which are inherently unsustainable because of their non-renewable and finite nature), the understanding and implementation of optimal mineral development has been evolving over the years. Many fields such as materials and engineering sciences, economics, social sciences, politics, and history etc. are contributing to the development of innovative technologies, mechanisms and strategies that can ensure that optimal mineral development results in the capture, retainment, and leverage of the full range of the potential benefits from mineral production (Calas, 2017; Bridge, 1999).

With the detrimental effects of the stagnation of the global economy and the uncertainty of its future (especially in reference to declining commodity prices) weighing more on countries that largely rely on the mineral production and export of a small range of products, this has reiterated the need for economic activity in these countries to be diffused across other economic sectors (Fruman, 2017). Economic diversification strategies would reduce the exposure of mineral economies to mineral price volatility, increase their capacity to handle price fluctuations and foster the delivery of sustained, job intensive and inclusive growth (Fruman 2017; Bridge, 1999).

Hitherto, with the drive for RN and optimal mineral development, governments of mineral-rich states are setting as one of their central public policy issues, the diversification of their economies from the foundation of their mineral endowments. These governments are using various instruments to foster more economic linkages such as fiscal instruments - for promoting further mineral beneficiation so as to stimulate industrial and economic growth and development. With South Africa (SA) not being left out in this drive for RN and optimal mineral development, her government has and is proposing to put in place many economic diversification policies. These policies include those promoting the downstream parts of its mining core-business; those promoting backward, side-stream activities; and/or those promoting lateral migration (Bridge, 1999).

Resource nationalism and ultimate economic diversification from resource-dependency forms the context on which this research is based. Therefore, against this backdrop, the main focus of this research would be on exploring ways of adjusting the parameters of one of SA’s mineral fiscal instruments - the new mining royalty regime, which has as one of its main objectives the fostering of mineral beneficiation in SA. The goal of this adjustment is for the realization of a system that allows for optimal mineral resource use and management of mineral resources rents. In the perspective of RN, this study seeks to contribute to ensuring that the citizens of South Africa benefit substantially from their mineral resource endowment.

For the purpose of fruitfully facilitating the focus of this research, several statistical data were used and depicted in Figures and Tables. Hitherto, it is important to note that in this study, as much as possible, the cap year for the statistical data depicted in most of the statistical figures and tables, was year 2017. This was due to data availability as at the time of carrying out this study. However, in the case of the financial data used in carry out the econometric assessment needed to provide answer(s) for the research question of this study, the cap year was 2015. This was due to different limitations such as lack of the annual reports/detailed financial information for the some of the case studies used after 2015, or change in reporting styles of financial information of related business segments after 2015 etc. Hence, for suitable comparability, these limitations were avoided by excluding the years after 2015.

1.2 RESEARCH BACKGROUND AND CONTEXT

Currently, re-emerging trends of great significance include those in which mineral-rich countries are insistent on realizing a greater direct share in wealth generated from mineral development and more requirements to foster other socio-economic linkages from mineral development programmes within their jurisdictions. These trends have initiated renewed interests in mineral-rich states of revising and restructuring their mineral policy instruments like fiscal policies (e.g. mineral royalty regimes), which are valuable in facilitate the realization of economic linkages from their mineral resource base. SA has not been left out of this as the Mineral and Petroleum Resources Royalty Act 2008 (MPRRA) was enacted in order to effectively reap fair and significant benefits from the development of its natural resource endowments for the sustainability of the well-being of the present and future generations of South Africans (Oshokoya, 2012).

The MPRRA's main purpose was to impose the charging of royalty for any transfer of mineral and petroleum resources, in accordance to Mineral and Petroleum Resources Development Act 2002 (MPRDA). The receipt of the royalty payments is for compensating the State for the extraction of her non-renewable mineral resources by mining companies. This compensation would be used for sustainable investment and development for the purpose of enhancing the economic well-being of the nation. However, its structure was not designed only to capture rents but promote local beneficiation of South Africa's minerals by incentivising mineral beneficiation projects. National Treasury saw this initiative to be one of the ways to achieve the government's beneficiation objective, so that industrialization and economic growth and development can be realized eventually.

The MPRRA stipulates a dual *ad valorem*, sliding-scale formula method of charging royalties, after classification as either refined or unrefined mineral resources. This dual sliding-scale formula mechanism imposes self-adjusting royalty rates for minerals, according to the level of refinement and profitability (MPRRA, 2008). This implies that it automatically recognizes downstream beneficiation of mineral products. The formula provisions for refined minerals allows for reduction of royalty rate as beneficiation increases in order to compensate for the higher sales value of refined products (Oshokoya, 2012).

With the understanding that a country's legal/regulatory environment is a key determinant for investors when considering investment destinations, a research by Oshokoya (2012) was conducted to assess the impact of some of the policy intents of the MPRRA (which came into force in 2010) on investment decisions. In her research, she initially briefly assessed the rent-capturing aspect of the MPRRA. Based on data from Statistics South Africa (Stats SA) as expressed in Figure 1.1, the black-coloured thin solid line represents the actual data for mining taxes paid by the industry in years 2004 to 2009, before the royalty regime came into force. In the same Figure, the dotted lines depicted for years 2004 to 2009 represent estimated values for the case when the new royalty regime was built into the financial data of previous years. This was carried out to assess what the effect of the new royalty regime would have been in those years. In light of this, it was found that the mineral sector would have become significantly more important to the national economy. This observation is premised on the realization that the mining industry's contribution to company taxes would have risen to about 9% on average in those years. Additionally, in Figure 1.1 when data of mining taxes (which is inclusive of royalty payments) for the current years after the royalty regime came into force (as depicted by the red-coloured thick solid line) were observed, it can be seen that the sector's tax contribution was still important to the economy. Although, it can be further deduced from the Figure that the significance of the sector with respect to mining taxes from year 2010 (the year the royalty regime became operational) till year 2017, was not as substantial as it would have been if the royalty regime was operational in the commodity boom times of recent past (years 2004 – 2008).

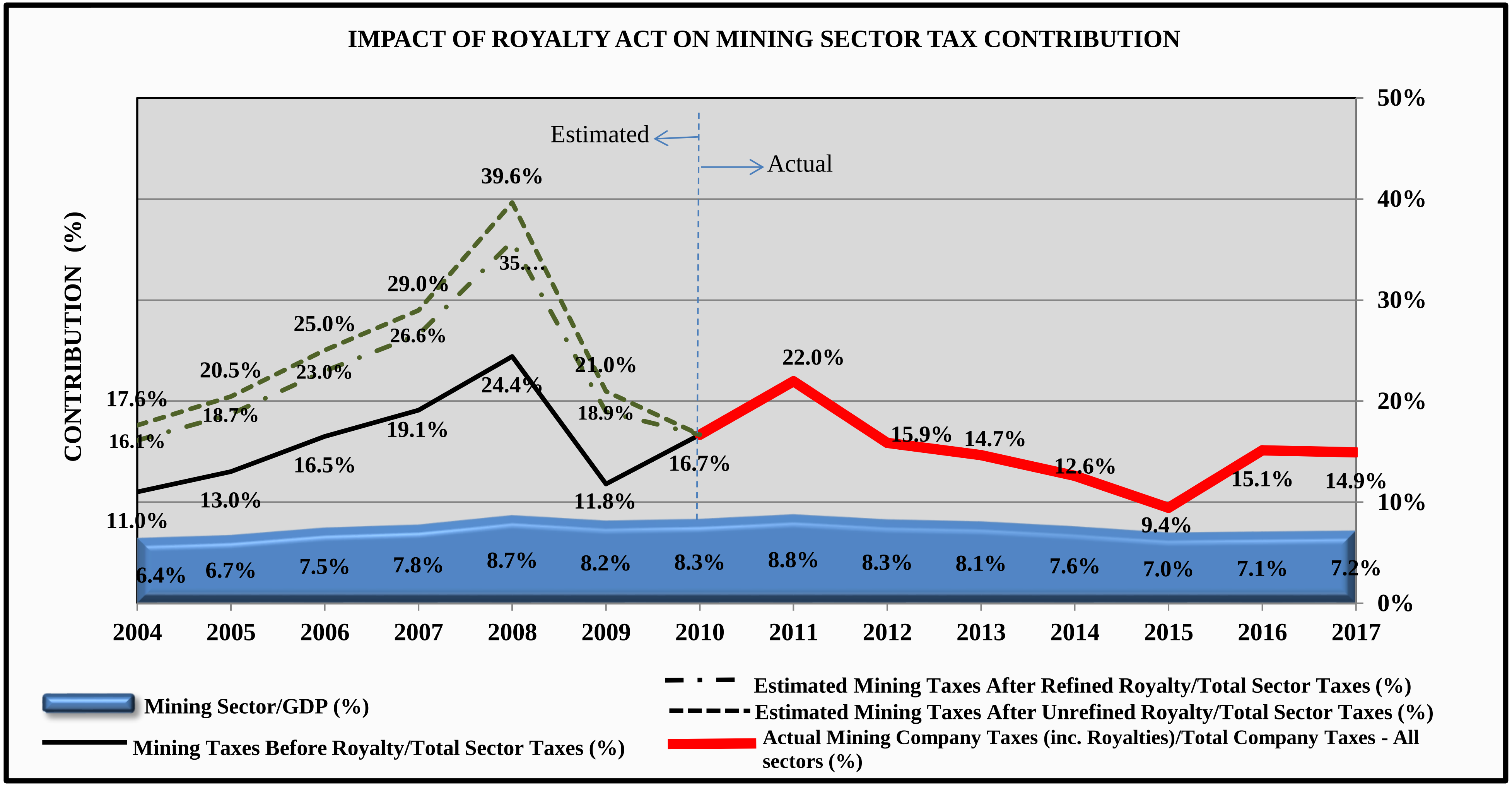

Figure 1.1: Impact of the new royalty on mining taxes. Source: Stats SA (2018a and b).

In this vein, in another article by Cawood and Oshokoya (2013a), the statistics (as seen in the Table 1.1 below) further demonstrated the importance of mining fiscal flows to the SA economy in relation to other sectors. In Table 1.1, which shows the tax to turnover contributions of all economic sectors in general and that of the mining sector, it can be seen that the taxation regime has already resulted in mining companies paying more taxes than other economic sectors, with the combination of income tax and the recently introduced mining royalties. This is deduction is supported by the fact that the tax to turnover contributions of the mining sector in all the years was almost twice the tax to turnover contributions of all sectors. Even in the year 2015, when the mining sector generally functioned at no profitability[1] (as depicted by the 'negative' profitability ratio – EBIT to Revenue), the mining sector was still a major tax contributor to SA's economy in comparison to all of SA's economic sectors.

1 According to Rossouw (2015), "financial performance for the South African mining industry in 2015 was extremely challenging and downcast". The challenging performance of the SA mining sector in 2015 financial year that resulted in shrinking margins and impairment provisions was largely due to "local cost pressures, labour action, a continuing downswing in commodity prices and declining trend in market capitalization" (Cornish, 2015).

Table 1.1: Comparing profitability and tax-take between mining companies and the total economy.

All Sectors														
Year:	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
EBIT/Revenue (%)	11%	12%	13%	14%	15%	11%	11%	11%	11%	10%	10%	9%	10%	11%
Tax/Turnover (%)	1.8%	2.2%	2.6%	2.6%	2.6%	1.8%	2.0%	2.0%	2.0%	2.0%	1.6%	1.5%	1.3%	1.4%
Mining Sector														
Year:	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
EBIT/Revenue (%)	18%	24%	29%	31%	41%	18%	23%	24%	17%	7%	11%	-3%	11%	5%
Tax/Turnover (%)	4.3%	5.5%	7.2%	7.6%	8.1%	3.2%	4.6%	5.7%	4.5%	4.0%	3.0%	2.1%	2.9%	3.1%

Source: Stats SA (2018a and b)

Furthermore, Table 1.2 below provides supporting indication as to how the tax-take from the mining sector, especially on addition of mineral royalties, has increased its importance in the South African economy.

Table 1.2: Actual Tax collected (ZAR million).

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
	Total	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**
All Sectors	85145	105567	119078	128963	140338	127396	119039	113074	129422
Mining Sector	10051	17595	26154	20462	20566	16062	11242	17108	19324

Source: Stats SA (2018a and b)

From the Table 1.2, it can be observed that mining taxes increased from R10bn in 2009 (the year before the Royalty Act was introduced) to R26.2bn in 2011 (the year after the MPRRA was introduced). Also, with the Royalty Act coming into force in March 2010, the total value of mining sector tax contribution, in year 2010 saw an increase from R17.6bn to R26.2bn (49% increase) in 2011. However, even though the addition of royalty-contribution from the mining industry has resulted in the increase of the significance of its tax contribution in comparison to all sectors, a decline in its tax contribution can be observed when comparing year 2011 to years 2012 to 2017. The decreasing tax contribution of the industry from R26.2bn (2011) to R20.5bn (2012) down to R19.3bn (2017) is reflective of the adverse impact on mining companies' revenues and profits, which have arisen from issues like:

- The increased labour strikes of 2012 (added on to the previous uncertainties surrounding the drive for nationalisation of SA's mines, in the name of realising RN), thereby, leading on to escalated loss of investor confidence;
- increasing production (input) costs – labour, energy, infrastructure etc.;
- weak demand for mineral and metal products from emerging economies like China; and
- Unfavourable market conditions and commodity prices etc.

Moving on, the deduction from the facts in the data displayed in Figure 1.1 and Tables 1.1 – 1.2 indicate that that the effectiveness of the rent-collection aspect of the royalty regime appears to be judicious as the contribution of mining fiscal flows to the SA economy increased significantly in relation to other sectors (most especially in good commodity price times). Also, as indicated in Figure 1.1, Oshokoya (2012) deduced that the regime would not necessarily deter investment because it allows for equitable sharing of economic benefits between State and mining companies, as royalties are charged in-sync with economic cycles. Additionally, considering what the SA economy seemed to have lost in terms of additional collection of mining royalties in 2004 – 2008 via the provisions of the new royalty regime, these deductions further support the need for self-adjusting fiscal systems which can adapt the magnitude of rent-collection to boom and bust times.

With the equitability and rent-capturing characteristics of the royalty regime briefly proven as being efficient, the main focus of Oshokoya's research was on investigating the beneficiation (refining) policy objective. She used the platinum industry as the case study of her research for years 2006 to 2010. In assessing the beneficiation intent of the MPRRA, she found that the economic-linkage objective of the regime is in line with global trends of using fiscal instruments to encourage or discourage private sector initiatives such as Scandinavia case of using their policy instruments to promote the transition of their economies from being raw materials-based to being industrialized. The methodology she used for assessing the regime's beneficiation intent was based on Bradley's recommendations to the Western Australian (WA) royalty system with regards to mineral processing (1986) and Cawood (2011a) analysis of the MPRRA.

Bradley's recommendations was drawn from the analysis and conclusions drawn from his team's inquiry into the mineral revenues of WA in 1986. A summary of his analysis, conclusion and recommendations, which were based on a schedule listed in the WA royalty system is depicted in Figure 1.2. The schedule specified royalty rates scaled downwards per progressive mineral processing stage. The royalty assessment started from mine-head production charged at 10% to final refined production stage, charged at 2.5% (Bradley, 1986). The schedule also specified the cost required to take production to the next mineral processing stage.

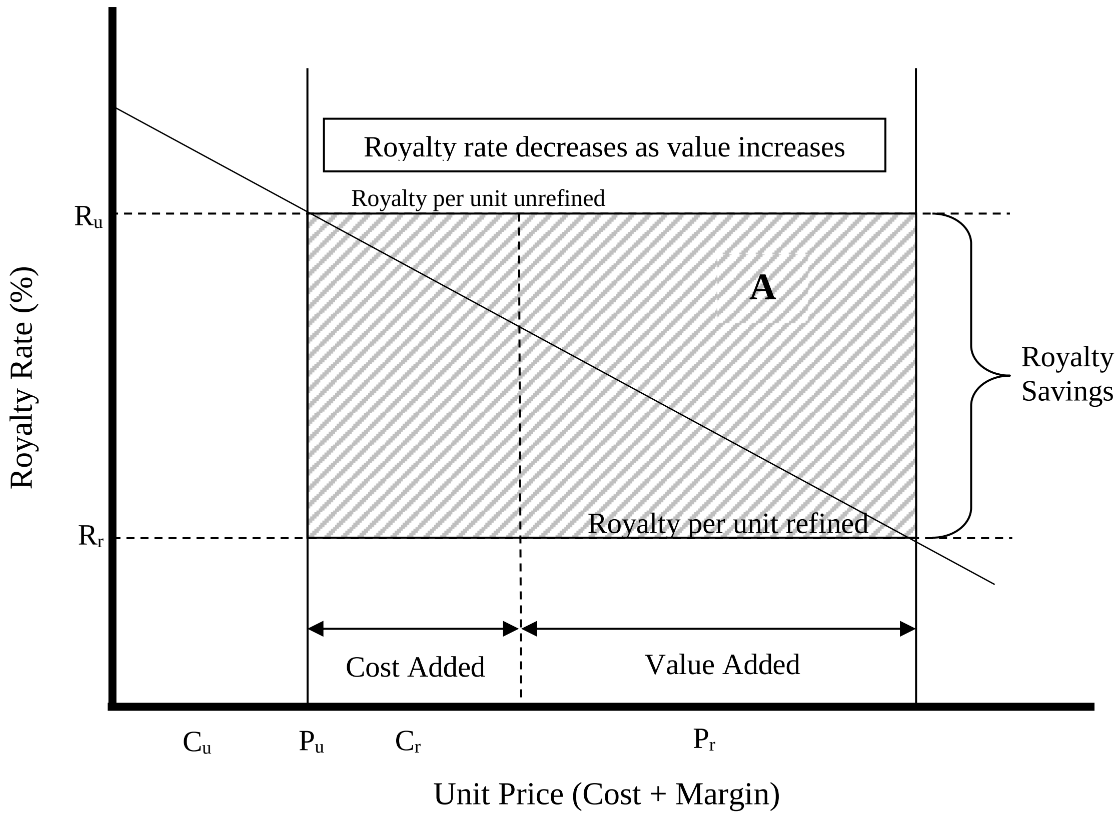

Figure 1.2: Relationship between royalty rates and value-added. Adapted from Bradley (1986).

Where,

Cu = Cost for minehead production;

Cr = Cost for final refined production;

Pu = Price paid for mine head production;

Pr = Price paid for final refined production;

Ru = Royalty paid for mine head production i.e. 10%;

Rr = Royalty paid for final refined production i.e. 2.5%; and

Area A (shaded) = Royalty savings which accrues to the developer for moving on to refined stage.

From the figure above, it can be observed that there is a negative relationship between the royalty rate and unit price as the policy objective is realized when the royalty rate for unrefined mineral resources shifts down to the royalty rate for refined mineral resources. Due to the fact that additional costs are needed to move the product from minehead production stage to other stages of refinement, which results in the product being bought at Pr, this reduces Area A to 'value-added' portion. These value-addition costs are expressed as a share of final product and value added to a mine's profitability is given as the difference between the price received for final product and the total cost required to bring production to this desired state of mineral processing. According to Bradley's analysis, if Pr increases but Rr and Cr remain the same as specified in the Schedule, the value-add increases and vice versa. Also, if Cr increases but Rr and Pr remain as specified, the value-added portion reduces and vice versa. Bradley deduced that the investment in value-addition can only be justified when the difference in unit price less value-addition cost is greater than the additional costs incurred in refining the production but if the amount of value-added is not significantly greater than this cost, it would not be worth it to invest in bringing on a refining facility. He, therefore, concluded that the problem was not that some value would not be added to the developer's profitability but that if this value-add is not significantly more than the additional refinement cost, Rr assessment would be a disincentive. In light of this, he recommended that the WA royalty system's mineral processing needed to be re-worked.

Moving forward, for application to the SA royalty case, Cawood (2011a and 2011b) developed models based on Bradley's conclusions and recommendations. However, before this was done, he incorporated the similarities and differences between the unique features of the SA and WA royalty regimes. For instance, one of the peculiarities of the SA royalty system as opposed to that of WA system is that there is a minimum (compulsory) royalty payment rate of at least 0.5% in cases of no profitability and irrespective of level of refinement. Figure 1.3 below illustrates Cawood's work.

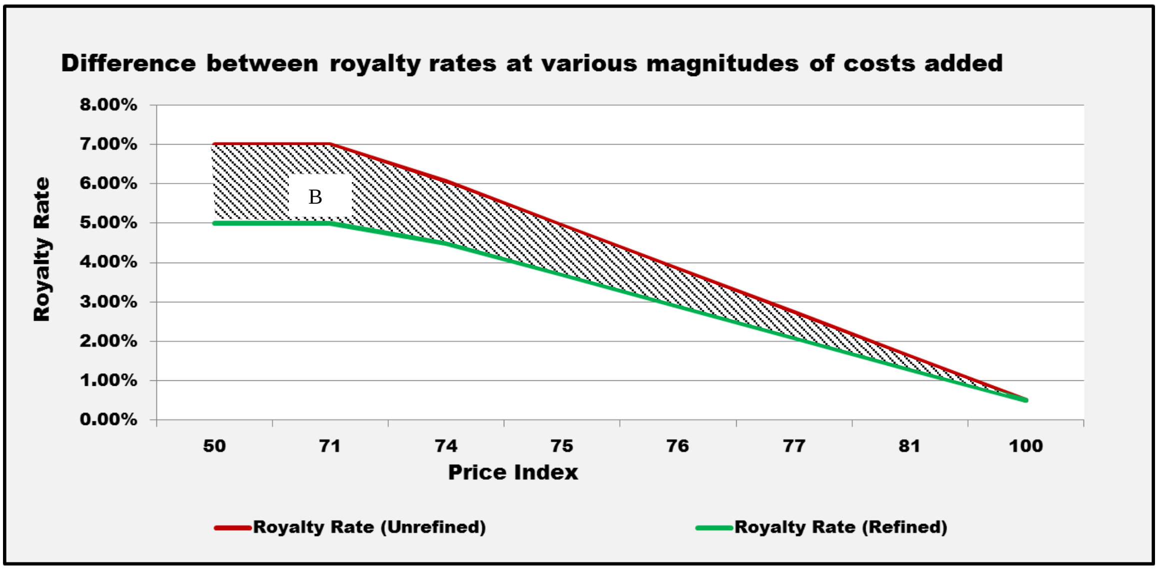

Figure 1.3: Relationship between royalty rates and sales price. Adapted from Cawood (2011a)

In Figure 1.3, on the price index axis, sales price for final product (either unrefined or refined final product) was used as a proxy for gross revenue and it consists of different proportions of production costs plus EBIT (profit). Illustratively, at the price index of 100, it means that the proportion of production costs is equal to sales price received, implying that no profit was made. Therefore, the royalty rate of 0.5% is still paid by the producer at price index 100. Furthermore, it should be noted that the reduction in price indices represents cases in which the lower the price index, the lower the proportion of production costs in relation to sales price is, and inversely, the higher the EBIT portion. Hitherto, at each level of price index, the royalty rate that the producer would pay is specified. Also, Area B like Area A in Bradley's work represents royalty savings.

Based on the peculiar provisions of the MPRRA, further work carried out by Cawood (2011b) sought to check the effect that different proportions of refinement cost (as a percentage of sales price) has on value-added. With different levels of combined cost of concentrate plus target EBIT magnitudes, different proportions of refinement costs were varied. Observations were made at refinement costs of 10%, 20% and 30% of sales price. See Figures 1.4 – 1.6.

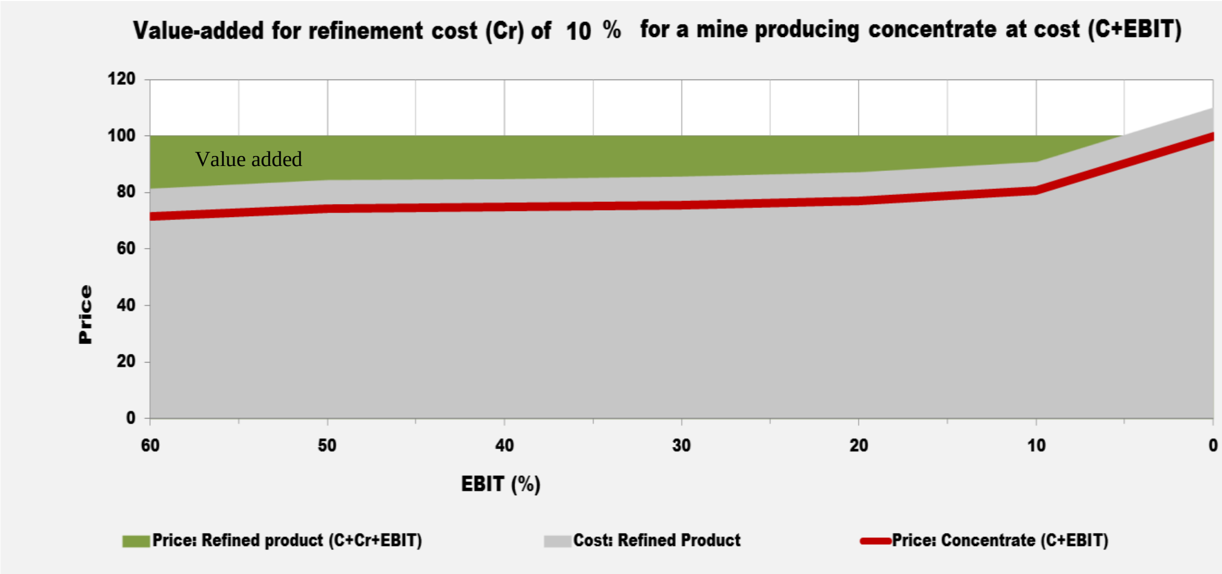

Figure 1.4: Value-added for refinement cost of 10%. Source: Cawood (2011b)

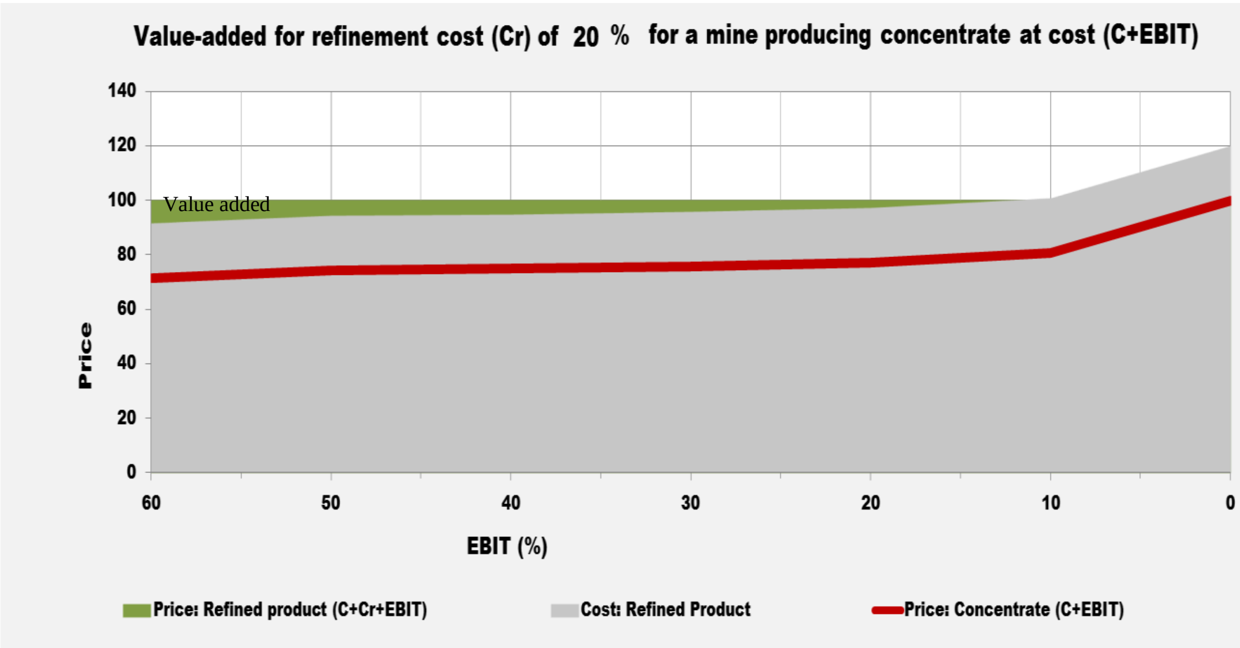

Figure 1.5: Value-added for refinement cost of 20%. Source: Cawood (2011b)

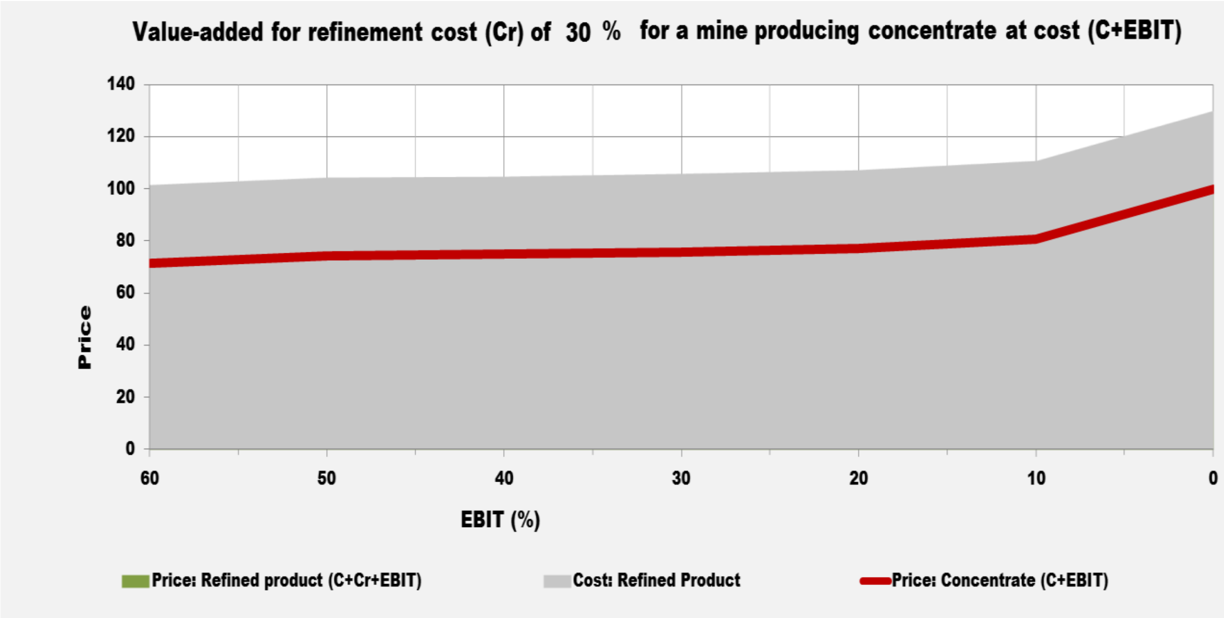

Figure 1.6: Value-added for refinement cost of 30%. Source: Cawood (2011b)

In Figures 1.4 – 1.6, it can be seen that value-added diminshes as refinement cost increases from 10% to 20%. Value-add vanishes when refinement cost is 30%.

Oshokoya (2012) used the platinum industry as the case study for applying Cawood's model. Platinum industry was used due to its position in terms of its royalty contribution to the SA economy plus its specification as a mineral of dual characteristics as per the MPRRA. She carried out a cash flow analysis on a platinum producer (used as a proxy for the platinum sector) that mines and refines the metal, and applied the royalty formula.

The results from the first econometric analysis[2] scenario of royalty savings and proportions of refinement cost of sales price indicated that if the MPRRA's reduced rate provision for refined products was the only incentive given to motivate miners to become refiners, that incentive would not substantial enough.

In another scenario analysis carried out by Oshokoya to determine what the effect of 'controlled/conservative' capital expenditure would be on royalty savings, it was

2 Econometric analysis included the application of Bradley and Cawood models to real-time data from SA platinum operations. The purpose of this analysis was to further investigate whether or not the policy intent of motivating mineral producers to add sufficient value to production, so that the final products meet the Royalty Act's definition for a refined mineral resource, would be achieved.

observed that in good profit years, in terms of value added from royalty savings, the miner-turned-refiner that is assessed based on refined royalty payments would have some value accrued to its financial position. However, the reverse was the case for years of bad profits. This implied that in good years, the regime was capable of achieving its beneficiation objective under 'special' cost/expenditure conditions.

Conclusively, Oshokoya (2012) stated that in general, the MPRRA's beneficiation incentive was insufficient and not likely to encourage platinum miners to become refiners. Nonetheless, seeing that the equitability and efficiency characteristics of the MPRRA was briefly demonstrated to be sound, and although the beneficiation provisions appeared to be unable to realize the mineral beneficiation objective of the SA government, she recommended that this initiative should not be abated. Instead, further studies could be undertaken to investigate ways of improving the design of the regime to achieve its policy objectives. Adjusting the royalty regime's beneficiation parameters would work towards ensuring increased benefit accrues from mineral beneficiation even in bad price times, thereby, possibly increasing the magnitude of the mining-taxes-plus-royalty-payments data represented by the red thick solid line in Figure 1.1 for years 2010 till date and beyond.

In another study done by Cawood and Oshokoya (2013b), they found and illustrated, inter alia, that:

- South Africa had RN firmly ingrained in its mineral law and policy framework;
- The RN instruments within the existing tax law and policy framework already collect resources rents;
- Mining companies are already paying more taxes (relative to turnover) than other companies in the economy because of a combination of income tax and the recent introduction of mining royalties.

Claims of non-delivery of benefits from the sector to citizens had been 'on-going' even before these facts and findings were illustrated. With public unawareness of these facts, public anger and anger arose, asking for SA mines to be nationalized in the name of pursuing RN. Hitherto, the ANC carried out further research for an informed debate on resource nationalism, on the State's role in mining. The result was the SIMS (State

Intervention in the Mineral Sector) report (ANC, 2012), which debunked the use of nationalization to achieve RN but recommended, amongst other things, that:

- More economic linkages should be created from the mineral sector;
- A Resource Rent Tax (RRT) be introduced; and
- A Sovereign Wealth Fund (SWF) be created and funded by proceeds of the RRT.

With beneficiation being linked to the rise in resource nationalism, which is buttressed by higher commodity prices, Cawood and Oshokoya (2013b) agreed with the SIMS economic linkage recommendation. They, however, considered the SIMS recommendation of introducing a 50% RRT, over and above the existing rent capturing instruments, as inappropriate. Their position on this is based on the fact that existing tax law and policy framework already collects significant rents from this sector, therefore, the addition of an RRT would add to mining companies' tax burden. Furthermore, there is no justification in either the SIMS report or in the actual amounts collected from mining companies that a RRT will be more efficient than the current system, neither is there any evidence to suggest that a RRT will achieve the desired developmental objectives.

Cawood and Oshokoya (2013a) posited that government should not be too hasty to change the system by introducing more instruments because it would add to current confusion and be a disincentive to investing in South Africa. Instead it should maintain stability of the rules governing mineral development in South Africa and have patience because, for example, the new royalty regime is starting to make an impact. Maintaining stability would give the government room to further investigate mechanisms for more optimal ways to use and manage the rents for better delivery of public benefits. Improving and optimizing the structure of the MPRRA mechanism, which combines rent-collection with economic linkage objectives, is an example of an opportunity to explore.

Furthermore, they established that the issues of perceived non-delivery of benefits by the mining sector are matters relating to revenue management, rather than revenue collection. Therefore, effective management of resource rents collected by the RN instruments in the existing tax law and policy, e.g. MPRRA, could be achieved through a SWF mechanism. This mechanism can be used to fund the infrastructure that will facilitate mineral beneficiation/industrialization required to "shift of the country's industrial base from its current dependence on natural resources along a high-technology growth path" (Northern Cape Province, 2005). It would thereby facilitate efficiency in the delivery of benefits to its citizens and maximise long-term development for the benefit future generations.

Hitherto, it is apparent that one of the ways that the South African government seeks to ensure optimal mineral development is by motivating and encouraging the establishment of more beneficiating companies/projects as well as ensuring that rents generated from its resources result in maximum benefit of its citizens.

1.3 OVERVIEW OF THE MINERAL DEVELOPMENT'S POTENTIAL ABILITY TO CONTRIBUTE TO INDUSTRIALIZATION.

A popular perception which has been held over time is that mineral endowments seem to be detrimental to its host economy because they appear to offer lower potential for long-term economic growth than other economic activities such as manufacturing. The poor economic performance of many mineral-rich countries seems to also support this notion. However, from all indications this lower-growth potential only exists because of issues like corruption, existence of weak inefficient institutions and the lack of primary commodities production resulting in many advantageous backward and forward linkages to the rest of the economy than manufacturing (Hirschman, 1958; Seers, 1959; Baldwin, 1966). In contrast to this view, the experiences of other countries which have dealt with these poor performance issues, suggest that development strategies based on raw materials do actually form a solid base for sustainable industrialization. Some of these countries which include Sweden, Finland, Norway, U.S, Canada, have shown that with economic linkages from natural resource development, diversification and growth of more advanced industries can be achieved.

In the latter part of the 19th century and the first few decades of the 20th century, mineral development typically served local or regional communities and industry. High costs of transportation in that era discouraged long-distance transportation of raw-materials, production inputs and outputs. This allowed for mines, producers of input goods and services, and industrial centres (where mineral ores were processed and in transformed into finished products), to be located close to each other. Also, due to relatively high transport costs of that era, the shipping of higher-valued semi-finished or finished products was economically beneficial to producers, as opposed to the shipping of bulky, low-value ores.

However, by the mid-1960s, transportation costs had reduced significantly, particularly for long-distance ocean transportation of bulk materials, which meant that mines, mineral-processing facilities and final consumers could be located farther from each other (Eggert, 2001). Each component began to be located nearer to other imperative inputs, like cheap hydroelectric power. Also, with the increasing size and complexity of the necessities (– technical skills, expertise, equipment) to efficiently run a mine becoming more specialized and often inadequately available locally, multinational companies began to obtain these from outside mine regions. This resulted in local economic linkages becoming smaller as compared to earlier times when mines were simpler and located closer to industrial centres (Eggert, 2001).

Currently, many developing resource-rich countries especially those in Africa are beginning to look at using reduced transport costs for their advantage. In this way, they aim at combating the negative impact that reduced costs has had on the realization of large-scale mineral processing in their jurisdictions. Using mining beneficiation (processing) as a means to tackle the economic challenges experienced by mineral-rich countries, promotion of diversification and strengthening of other sectors is based on governments bearing the following in mind:

- optimal mineral development and RN;
- the limited life span of mineral resources;
- unsustainability of reliance on taxes from raw mineral extraction due to mineral price volatility and cyclicality;
- advances in urbanization and industrialization;
- Reduced terms of trade of raw mineral exports in comparison to manufactured goods.

Mineral beneficiation allows for the development of downstream industries where raw materials are transformed into more finished products (such as medical devices, electronics, industrial machinery, tools & equipment) that can be sold at higher prices. In general, the establishment of mineral processing facilities in the vicinity of mine provides lots of benefits. They include the development of local economic activities, stimulation of the construction of infrastructure - roads, housing, and facilities, increase of opportunities to small and medium-scale enterprises (SMMEs) delivering products and services, augmented sales revenue and a greater contribution to the GDP of countries, the creation of additional and quality job opportunities, reduced exposure to fluctuating commodity prices, increased sustainability (Adam, 2012).

All mineral development has the potential for downstream processing. However, it would only be beneficial to develop this downstream linkage from mining as an engine of industrial development, if there is sustained demand for the mineral(s) themselves. Anti-beneficiation proponents opine that of recent, the world market does not favour developing downstream linkages because returns have been driven downwards by world overcapacity (ISG, 2011). Also, they say that with the decline of transportation costs and global markets becoming more integrated, the advantage of nearness to the vicinity of raw materials production has diminished.

These anti-beneficiation advocates further argue that there is little realistic opportunity to enter this market because without the generation of above average upstream and side-stream linkages and local manufacturing, the immediate market for refined mineral products is likely to be low. Therefore, they say that placing downstream processing of minerals before export at the top of the national agenda for the mineral industry is an inappropriate development path to be pursued (ISG, 2011). Conclusively, they posit that using beneficiation as a development strategy needs a case by case justification, without which beneficiation could prove extremely costly (Baartjes, 2011).

Another school of thought holds that there are still current and future downstream opportunities being presented with respect to servicing the expected growth in demand for finished mineral products, mainly from African markets and other emerging developing countries. In light of this, the global mining industry is looking to increase investment in mining and refining activities in countries where raw materials are sourced so as to cater for the shortfall in supply and to take advantage of high prices which may arise. At source countries, the use of local manufacturers by mines and refining sites could theoretically reduce the import and logistics-related costs which they currently incur (The World Bank, 2011).

The profit motives of mining and refining companies which make them to be more keen on sourcing their inputs from the least-cost providers that meet their quality, quantity and reliability standards, opens greater outlook for a more efficient local manufacturing industry. This would also potentially help to create markets for the beneficiated products, raise the incomes of local producers and improve industry competitiveness over the longer term (The World Bank, 2011). On the government-side, based on this expected growth in demand, many (source) African governments are introducing new legislations to motivate and/or compel mining companies to invest in mineral beneficiation. This new drive aims at allowing mineral host states to achieve more equitable sharing of their resources wealth-potential. This drive is already evidenced by the intended related actions to be taken by SA government (Adam, 2012).

A study carried out by Stilwell *et al* (2000) showed that output and employment multipliers for the South African mining sector were either slightly less than or equal to the economy-wide multiplier averages for all other economic sectors. This suggested that mining in SA was not necessarily uncoupled from the rest of an economy and that a wide range of possible linkages from the sector existed for it to be better integrated into the national economic fabric (Eggert, 2001). Thus, harnessing these linkage opportunities requires that challenges such as those relating to deficiencies in human capital formation, particularly in knowledge intensive areas, as well as infrastructure inadequacies, unfavourable business climate must be addressed (ISG, 2011).

In light of the window of opportunity which argues for the strengthening of mineral beneficiation complemented with backward, forward and lateral economic linkages in the economy (Leeuw, 2012a), the SA government is pushing strongly to ensure that its citizens are not denied of the full benefit of the mineral value chain by the export of its minerals in raw-form. Therefore, in order to realize intended benefits from its mineral extraction and beneficiation sectors for the support of its socio-economic and developmental issues, one of the instruments to be used by the government is the Mineral and Petroleum Resources Royalty Act 2008.

The MPRRA's main objectives amongst other things are to charge royalties for any transfer of resources as well as to facilitate the beneficiation of SA's minerals. The rights given to the South African government to enact and utilize the MPRRA as one of the policies and regulations to review the constraints of downstream development, is certified by the Mineral and Petroleum Resources Development Act, 2002. The MPRDA vested the government with requisite authority as the custodian of its mineral resources to make certain that the exploitation of its mineral resources results in the significant and beneficial contribution to the living standards of every citizen of the Republic.

This policy instrument raised major concerns, which have been on the front burner of academic and industry-based discussions, with regards to the impact and effectiveness of achieving its policy intent. This issue was assessed, and the findings would be stated afterwards.

1.3.1 Current state of South Africa's Beneficiation Industrial Approach.

South Africa is richly endowed with vast amounts of mineral resources with an estimated monetary value of about $2.5 trillion, sees most of its minerals exported as raw ores, alloys or metals bars, rather than beneficiated products (Global Business Reports, 2011; Deloitte, 2011). This is supported by the illustration of the composition of SA's exports in year 2010 and more recently – year 2017 as depicted by Figures 1.7a and 1.7b below. Comparing both Figures further indicate that there has not been a significant change in the domination of SA's exports by raw minerals and metals rather than beneficiated products. These illustrations give an indication of the increasing need to expand the size of the value-added composition of SA's exports.

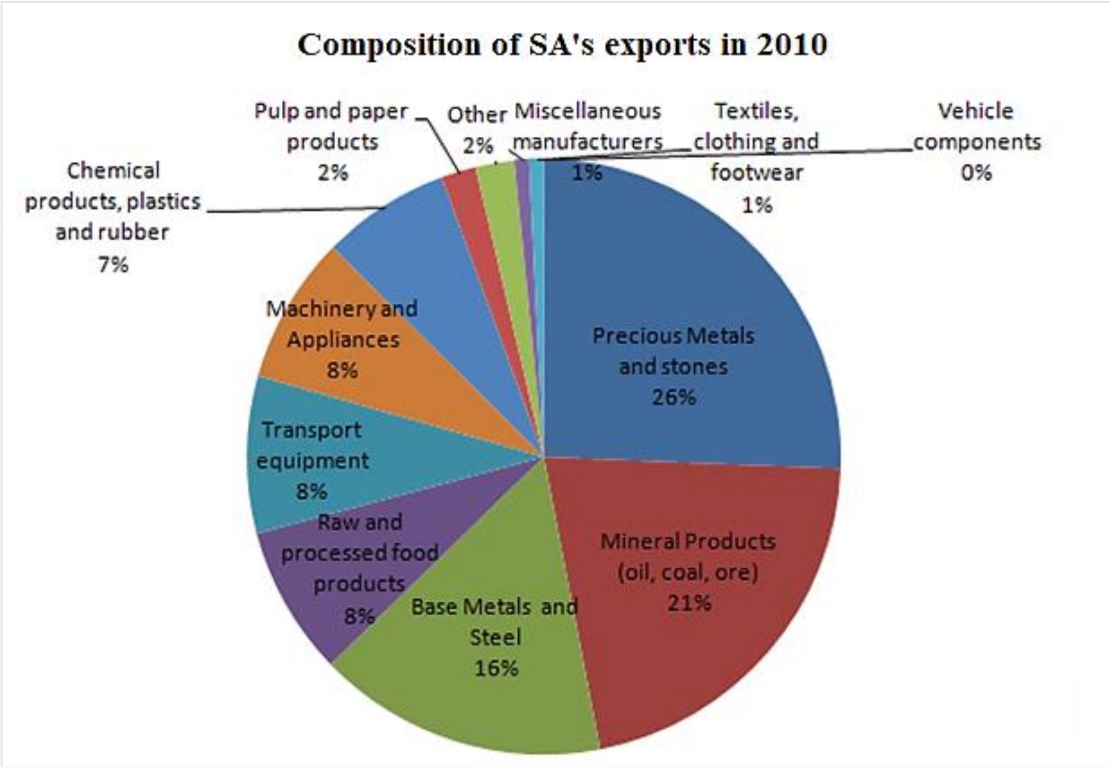

Figure 1.7a: Composition of South Africa's exports in 2010. Source: SARS (2010) in DMR (2013).

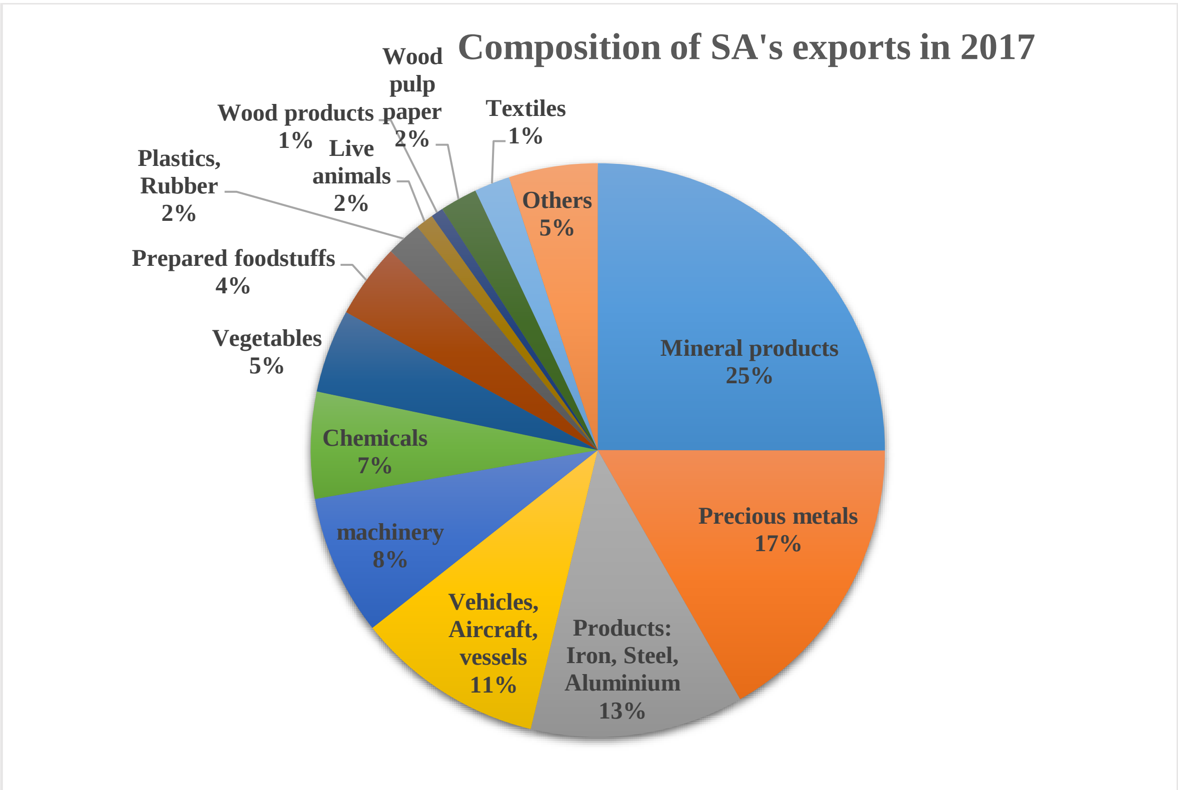

Figure 1.7b: Composition of South Africa's exports in 2017. Source: Adapted from 2017 Trade Statistics Tree Map (SARS, 2017).

With up to 89% of all the latent value of its raw minerals being lost through unbeneficiated exports (Adam, 2012), the value-added processing of minerals being a major industry and an important growth area in South Africa, cannot be overstated (Bureau of African Affairs, 2010). Figures 1.8 – 1.9 are used as examples to show that the countries that mine raw minerals are not necessarily the countries that fabricate final products from the raw minerals. These examples are further indicative of how much of value is lost by SA to other jurisdictions, who beneficiate a more significant proportion (than SA) of the raw minerals extracted in SA.

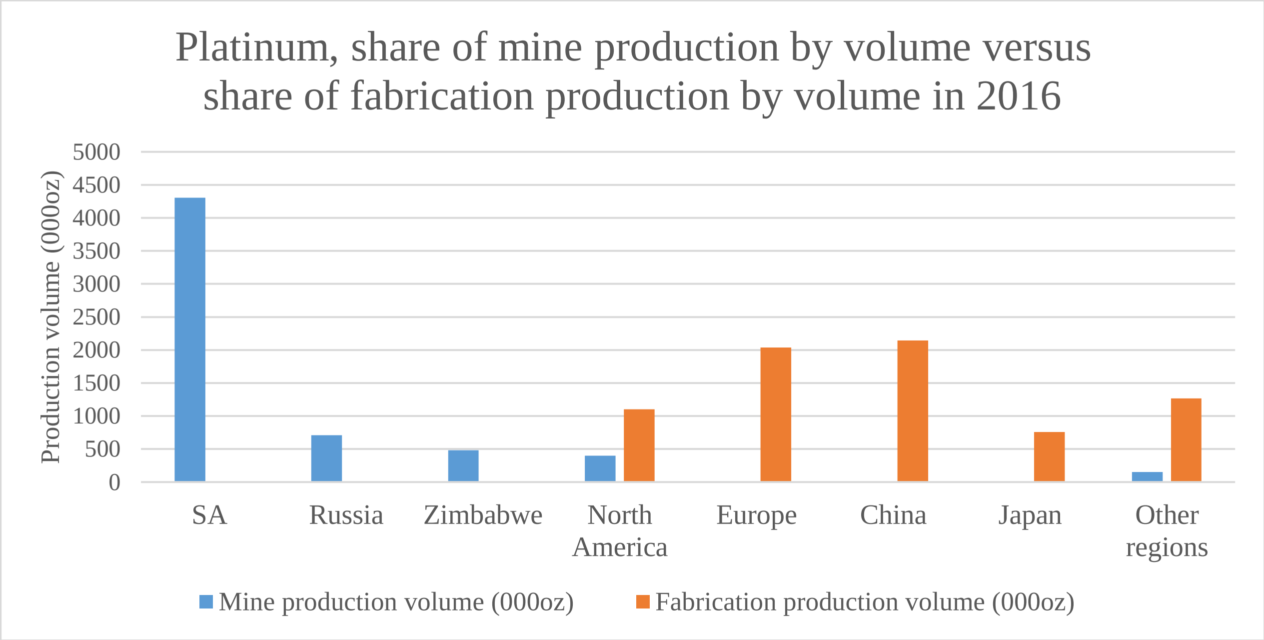

Figure 1.8: Comparing global share of raw mineral production with global share of beneficiation production (Platinum). Source: Thomson Reuters (2017a).

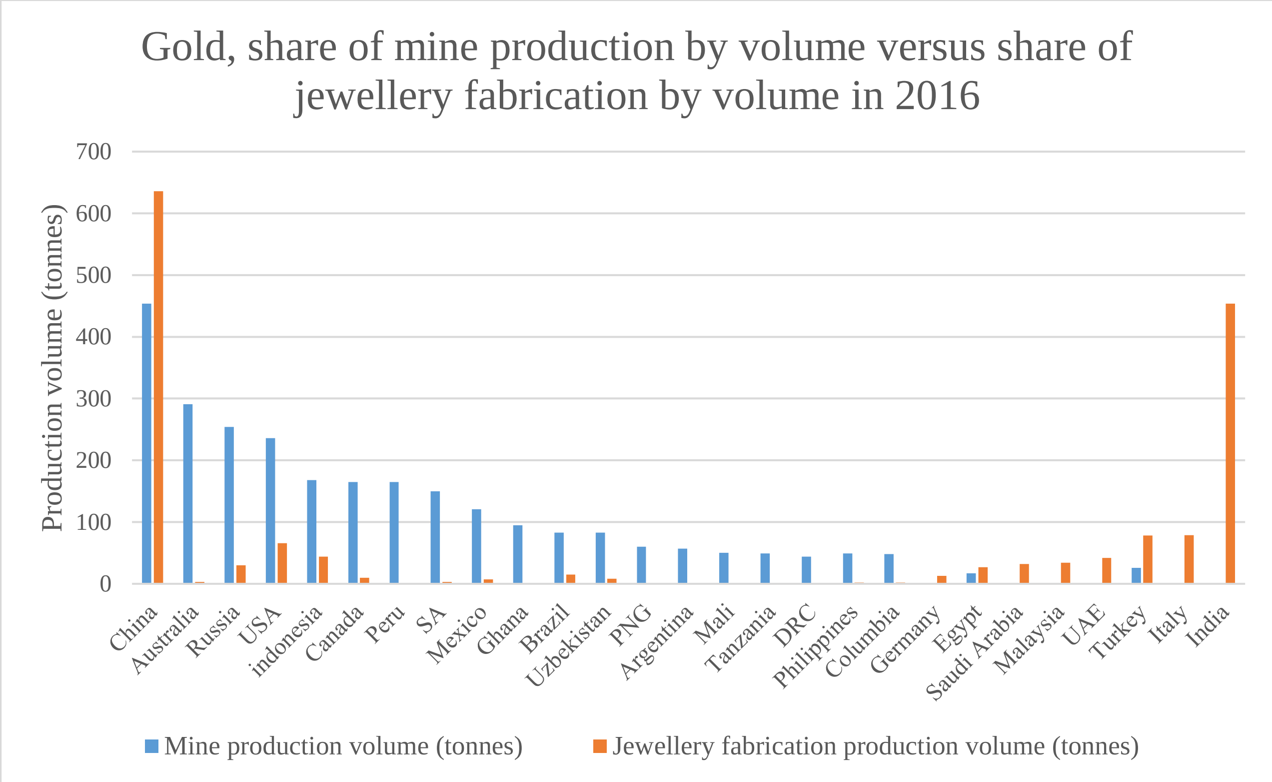

Figure 1.9: Comparing global share of raw mineral production with global share of beneficiation production (Gold). Source: Thomson Reuters (2017b).

Hitherto, it is imperative that this lost value be recaptured in SA, because mineral beneficiation would encourage the development of the mineral value chain to the stage of manufacturing of final products, where most of the labour-absorptive industries are located (Adam, 2012).

In light of the attractive benefits of an industrial strategy based on value-addition to natural resources, SA has adopted significant political resolutions. For instance:

- ANC Ready to Govern (1992), which states that “policies will be developed to integrate the mining industry with other sectors of the economy by encouraging mineral beneficiation and the creation of a world class mining and mineral processing capital goods industry”;
- The ANC’s adoption of its Polokwane resolution at its 52nd National Conference held in 2007 (ANC, 2007). It was stated that, among other things, their “programme must also deepen the linkages of the mineral sector to the national economy through beneficiation of these resources and creating supplier and service industries around the minerals sector”;

- Reconstruction and development programme: For the mining sector, the principal objective is “to transform mining and mineral-processing industries to serve all of our people. We can achieve this goal through a variety of government interventions, incentives and disincentives” (National Union of Mineworkers, 2011).

Against this backdrop, the South African Departments of Mineral Resources (DMR) and Trade and Industry (DTI) in conjunction with the National Treasury, seek to create an economic environment from the regulatory point of view which encourages undertaking mineral beneficiation. The role of the DMR is to certify that there are adequate quantities of locally mined minerals and concentrates to undertake mineral beneficiation; the DTI is to ensure the creation of a favourable regulatory and political environment for investment in the mineral beneficiation sector as well as for manufacturing of equipment and components and provision of services to the mineral sector; and the National Treasury is to look at providing tax incentives that will encourage higher level of participation in the mineral sector (Leeuw, 2012a).

The establishment of greater collaboration and harmonization between the DMR, Department of Trade and Industry and National Treasury for the promotion of the mineral beneficiation sector was largely driven by the provisions of the Minerals and Mining Policy for South Africa 1998, which was released by the Department of Mineral Resources (Department of Minerals and Energy, 1998). One of the main themes of SA’s mineral policy is ‘Business climate and mineral development’. This theme covers issues affecting the continuation of policies conducive to investment including those relating to mineral fiscal instruments (including royalties) and allocations from national revenue; mineral beneficiation; and minerals marketing. The general purpose of South Africa’s mineral policy was and still remains the development of its mineral wealth to its full potential and to the maximum benefit of the entire population. Therefore, for the purpose of this research, its main focus will be on the mineral beneficiation intent of its mineral royalty instrument and fair distributions from national revenue covered by this policy framework.

In line with the policy statement on promoting mineral beneficiation, other policies have been launched by the government through the Department of Mineral Resources.

They include the Beneficiation Strategy 2011, MPRRA, the New Growth Path policy, National Development plan (NDP), Industrial Policy Action Plan: IPAP 2013/14 – 2015/16 (IPAP5) and Integrated Resource Plan 2010 – 2013 (IRP) (DMR, 2011; MPRRA, 2008; SA Government, 2010; National Planning Commission, 2011; DTI, 2013; DoE, 2011). The general main objective of these policy instruments is to facilitate SA's realization of sustained economic growth and transition from being mineral-dependent into becoming a knowledge-based, labour-intensive industrial giant via its self-evident and logical mineral beneficiation potential. These polices are based on the general economic rule that with beneficiated products attracting higher prices due to their higher sales value as compared to raw, unrefined products, more opportunities are available to the South African minerals industry "to supply products with a significant local value-add" (DMR, 2011). Hitherto, the government has identified that mineral beneficiation involves a range of different activities including:

- Sophisticated, capital-intensive large-scale activities, such as smelting and refining; and
- Labour-intensive activities, such as craft jewellery, metal fabrication and ceramic pottery etc.

Furthermore, for the roll-out of the beneficiation strategy, the government specifies that the value chains of five commodities would serve as pilot projects before spreading the strategy over to the rest of its mineral endowments. These five value chains include:

1. Energy commodities;
2. Iron and steel;
3. Pigment and titanium metal production;
4. Autocatalytic converters and diesel particulate; and
5. Jewellery fabrication (Adam, 2012).

Hitherto, it must be acknowledged that the issue is not that no beneficiation is currently taking place in South Africa already, but that a greater degree of beneficiation is needed. In this regard, Takolia said that the achievement of this increase in beneficiated production "might require South Africa's miners to become manufacturers – something unlikely to happen in the short-term" (Carta, 2012). In response to achieving increased levels of beneficiation, the Minister of mineral resources, Shabangu reiterated that government's firm policy remained the realization of industrialization in SA and this policy includes value-addition taking place with all its raw materials and means for the facilitation thereof. Also, as regards the miner-turned-manufacturer notion, she further expounded that the policy does not expect miners to become manufacturers, as that would imply that they venture out of their core business. Instead, through mineral beneficiation mining companies would make available significant certain percentages of the output needed for local manufacturing (Carta, 2012).

The above argument supports government's opinion that companies involved in mineral extraction should also facilitate downstream minerals beneficiation. The government opines that mining companies taking on beneficiation processes would not be an unfitting burden since the primary mineral products, which they produce, would serve as inputs that will attract other tiers of the value-chain or industries, who possess metallurgical and manufacturing skills and expertise for value-addition. However, this view has been met with criticisms.

All these policy instruments are for the purpose of facilitating a significant leap from current beneficiation levels to aspired levels - full value-chain exploitation so as to achieve significant industrialization and employment. Nevertheless, these policy instruments must also address the challenges relating to input costs, investment in education, skills development, technological innovation, engineering research and knowledge creation and infrastructure development (- energy, transport etc.), which have limited beneficiation of minerals from occurring on a large scale in SA (Carta, 2012).

Having stated that one of the ways that the South African government intends to use to stimulate and encourage the establishment of more beneficiating companies/projects is through incentives like lowering royalty rates for such projects, this reiterates one of the focuses of this project – optimizing the beneficiation objective of the MPRRA. Another main focus of this project is using the MPRRA's rent-capturing feature to establish a most favourable system of management and use of the rent it collects.

1.4 IDENTIFIED GAPS

From the discussions above, critical issues have been identified and they are:

i. Lack of mineral fiscal instruments in mineral-rich developing countries to successfully facilitate the establishment of other economic linkages; and

ii. Lack of favourable systems for the management of rents generated from mineral development, which are to allow for maximum economic savings and investment for the benefit of citizens of host countries.

1.5 PROBLEM STATEMENT

Having identified these critical issues as gaps, this research aims at addressing them so that mineral-rich developing countries can realize the capturing of value-added activities within their states based on successful economic linkages from their minerals as well as optimal management of rents generated from mineral development.

1.6 RESEARCH QUESTIONS AND HYPOTHESES

In light of the need for efficient delivery of benefits to the citizens of mineral rich states, this project seeks to address two issues:

1. With reference to Oshokoya’s (2012) recommendation that the beneficiation initiative of the MPRRA should not be discarded off, can the beneficiation incentive provisions of the royalty regime be re-examined, adjusted and improved so as to adequately facilitate the realization of beneficiation linkages?
2. Having established that charging mining/beneficiation companies with royalty payments is the preferred way for the SA government to realize compensation for the depletion of its mineral assets, it is expected that these rents generated should result in savings for the country. Knowing that these savings can be invested in activities that would ensure the increase of the productive capacity of the rest of the economy, thereby helping with the long-term sustenance of the country, can the rent portion of the MPRRA be ring-fenced into a mechanism like Sovereign

Wealth Fund, in order to create an ideal system for managing and investing these rents?

1.7 RESEARCH AIMS AND OBJECTIVES

Mineral commodities have characteristics that make them differ from beneficiated and manufactured products. This is evident in their supply and demand, as well as production cost and sales price characteristics. As significant amounts of capital investments are needed to discover minerals, ensure that the ores found are economic to exploit, and then extract them, likewise also, very significant capital investments are also required by beneficiation/value-adding operations (Oshokoya, 2012).

Although the demand and prices for beneficiated/finished products are generally higher and more stable than that of raw minerals, this additional significant capital needed for going ahead with beneficiation requires some form of compensation. Also, in light of the fact that the current demand for beneficiated minerals in world markets has slowed due to oversupply, this further supports the need for compensation. This would ensure that the survival and long-run success of existing refining facilities is guaranteed as well as encourage the establishment of more refining facilities in lieu of catering for expected future demand from developing countries.

Even if prices are reasonably attractive, before capital investments are made into beneficiation projects, the risks and uncertainties surrounding the profitability of such projects are highly evaluated. Some of these key risk factors relate to production cost, productivity of inputs – human, physical, financial etc., transport costs and the overall business environment in which the proposed project will operate. It is note-worthy that the attractiveness or not of the country's business environment is a key determinant for investors when they compare the attributes of different destination countries. The tone of this business environment is set by a country's legal, regulatory and fiscal framework. Therefore, issues like the equitable administration of royalty/taxes charged must be pursued so that the business environment remains competitive and most importantly attractive to investors. A more predictable and equitable regulatory environment could increase stability and reduce risks for investors (The World Bank, 2011).

It is an accepted economic outlook that governments should ensure that the mining and beneficiation industries in their jurisdictions should make “rightful contribution to the country’s tax revenues and that the tax system should encourage adding value to raw materials” (Northern Cape Province, 2005). However, the ability of mining and beneficiation companies/projects to successfully contribute to the achievement of policy objectives and the long-run sustainability of any society hinges on the guaranteed survival and success of the business-case of their projects (Oshokoya, 2012). Also, rents generated by successful mining and value-added activities can be invested by government for further facilitation of its provision of the macro stability, governance, infrastructure and social services, which is needed by host citizens as well as the mining and refining industries, to prosper.

This study aims at addressing the concerns that hamper fiscal instruments such as the MPRRA, from resulting in optimal and efficient in the delivery of benefits to present and future generations of their citizens and maximum long-term economic development of their states.

1.8 STRUCTURE OF THE RESEARCH

The structure of this thesis would be as follows:

Chapter One Research background and aims of research.

This chapter gives background information concerning RN intent of realizing optimal mineral resource use and management of mineral rents in mineral-rich states. With the focus of this report being to find ways of the SA’s MPRRA fulfilling this RN intent, this chapter highlights the concept of using mining fiscal policies as development strategies, current status of beneficiation in SA and gives fairly detailed referral to the previous study that provided motivation to continue this current research. Also, the research questions and aims of this research would be discussed.

Chapter Two Resource nationalism, its modes of expression and its connection with optimal mineral use and revenue management.

In this chapter, the RN ideology, the history that led to RN concerns in developing countries especially SA and its different forms of expression overtime would be discussed. It would also discuss how RN links with the need for optimal mineral use (linkage creation) and optimal mineral resource rent management.

Chapter Three Expression of resource nationalism in mineral-rich Sub-Saharan African States: the drive to embark on local mineral value-addition.

This chapter will highlight the expression of RN in mineral-rich states of Sub-Saharan Africa, and how it obtains in SA specifically. based on the 'terms of trade' argument, the chapter would discuss the case for fostering economic linkages as one of the 'compulsory' routes for these mineral-rich SSA countries to take in order to realize industrialization in their jurisdictions.

Chapter Four Overview of South Africa's beneficiation policies and strategies.

This chapter would discuss the RN drive, 'terms of trade' argument and linkage development in South Africa in particular. Some of SA's linkage development policies, and the supporting instruments have been put in place to facilitate forward linkages – mineral beneficiation for further achievement of industrialising SA, would be discussed in this chapter.

Chapter Five Expounding on the MPRRA beneficiation policy intent and Research methodology.

In this chapter, the evaluation of the effectiveness of the various mineral beneficiation-related policies in SA would be narrowed down to the MPRRA. The structure and application of the MPRRA in terms of facilitating the beneficiation objectives of SA, would be discussed in detail in that chapter. The methodology that would be used to examine its effectiveness would be expounded in detail in this chapter for the purpose of determining which of its parameters need to be changed for government's goals to be achieved.

Chapter Six Commodity sector case studies: selection criteria and justification for the selection of the sectors.

In this chapter, the commodities sectors that would be used as suitable case studies for the purpose of assessing if the MPRRA will sufficiently motivate miners to become refiners, would be identified, highlighted and justified. This chapter would also discuss the selection criteria used to choose these sectors.

Chapter Seven Application of econometric analysis to commodity sector case studies and analysis of the results and observations from the case studies.

This chapter would consist of the financial data/information obtained for the companies' mines or divisions that were selected as suitable proxies for refiners and miners-only in the four commodity sectors, the description of the data and the assumptions, which would be used to facilitate the econometric methods that would be employed in this study. The chapter would further proceed to apply the methodology of this research to their 'real-time' financial data of these commodity sectors.

Chapter Eight Re-construction of MPRRA's structure for provision of more optimal beneficiation incentives based on policy options two to five.

Based on the results of chapter seven, which would lead to the indication of additional policy options available to the government, this chapter would consist of the description and test of each of these other policy options. The chapter would present and discuss the results of the econometric tests carried out on the policy options individually and in comparison, against each other. The comparative discussions that would be done in this chapter is for the purpose of realising the most optimal policy option available to the government for tweaking the current royalty formulae.

Chapter Nine Deduction of the most optimal policy option and proposed Implementation Plan.

This chapter would consist of the assessment of all the policy options in terms determining the value that each model would add based on different proportions of refinement cost (as a percentage of sales price). This assessment is for the purpose of providing further support for the choice of the most optimal policy option realized in chapter eight. Additionally, in this chapter, an implementation plan would be proposed for how the most optimal policy option should be effected by the government.

Chapter Ten Conclusion and recommendation.

This chapter would comprise of the summary of all the findings obtained in this research. It would also consist of the conclusions drawn in order to answer the research questions of this study. Finally, this chapter would consist of some recommendations for areas of further research needed to ensure that the beneficiation objective of the SA government can be realized.

1.9 CONCLUSION

In summary, this chapter gives a backdrop to the RN drive that begs for optimal mineral resource use and management of mineral rents for the benefit of the citizens of mineral-rich states. Also, with special reference to SA's MPRRA, the chapter highlighted the albeit pre-existing concept of using mining fiscal policies as development strategies that encourage mineral beneficiation so as to contribute more to increased economic growth and development in SA. In this light, a research background from a previous study which explored the plausibility of the beneficiation linkage provision of the regime was given in his chapter. The conclusions and recommendations of that study gave the lead for discussions about the need for further adjustments and improvements to be made on the policy instrument – MPRRA, which this thesis seeks to address.

Against this backdrop, a brief referral was made to the strategies, which the SA government has in place to facilitate its intent to stimulate the realization of beneficiation linkage (capturing more value) in SA. The current state of beneficiation in SA was also briefly alluded to as well as the research gaps and questions, which this thesis aims at addressing. Therefore, it can be concluded that this chapter has opened a lee-way for necessary discussion on exploring how to adjust the MPRRA instrument's provisions that are relevant for this research. The goal of this is to bring to fruition a system that further promotes mineral processing within SA, which in line with its government's industrialization objectives, as well as adequately manages the economic rents it already collects.

In chapter two, the history that led to RN concerns in developing countries especially SA, how RN links with the need for optimal mineral use (linkage creation) and optimal mineral resource rent management, will be discussed in more detail.

CHAPTER TWO

RESOURCE NATIONALISM, ITS MODES OF EXPRESSION AND ITS CONNECTION WITH OPTIMAL MINERAL USE AND REVENUE MANAGEMENT.

2.1 INTRODUCTION

With the recent commodity price boom of the 2000s, many mineral-rich developing countries have awoken to the realization that their states must not miss the opportunity to gain maximally from their resource endowments far more than any other external parties. They have therefore continued to institute the use of various policy instruments (legal, regulatory and fiscal) to extract the expected benefits from their resource endowments. As alluded to in the previous chapter, this study aims at exploring such instruments with particular reference to the mineral royalty used in SA. In that chapter, it was also mentioned that SA's mineral royalty instrument was formulated to facilitate the achievement of several vital benefits-delivery objectives to the state. By exploring how the parameters and provisions of such fiscal instrument could be adjusted so as to yield greater benefits, the goal of finding ways to realize optimal mineral use and mineral rent management in developing countries, could be reached.

Judging from the past, it has been recognized that the current drive of States to maximally benefit from their resource endowments resulted from an ideology called resource nationalism (RN). Therefore, it is important to first understand what the concept means before looking into modifying the instruments that have been put in place to yield the expected significant results of RN. This chapter gives insight into the RN ideology, its historical background, its different forms of expression overtime and how it links up with the need for optimal mineral use (linkage creation) and optimal mineral resource rent management.

2.2 THE CONCEPT OF RESOURCE NATIONALISM

Before the colonial era, many developing mineral-rich states mined their own minerals or obtained them from neighbouring communities through local trade. Colonization[3] of these States led to the stifling of their local mineral development strategies as mineral development became channelled solely for the benefit of colonial masters (Cawood and Oshokoya, 2013a). However, after World War II and independence of these States, the favourable global economic conditions and commodity price booms experienced in those years appeared to still be more advantageous to the major mining investors/companies[4]. The reaction of the host citizens in opposition to the skewed bargaining power in favour of investors, gave birth to the emerging theme of a country's sovereignty over its natural resources and a fairer distribution of the economic rent between the host government and mining investors. This theme became the philosophy that is now called Resource nationalism. Table 2.1 gives more details with regards to the history that led to the emergence of RN. It also gives an overview of global events that took place, which had effects on the mineral sector and influenced the different RN responses by various stakeholders in mineral development.

From the 1990s, in sync with a time of depressed commodity prices, host governments focused on ensuring that their jurisdictions were more attractive to mineral investments than others so as to increase the productivity and competitiveness of their mining industry (Kumar, 1995). By the 2000s (precisely between 2004 – 2012), the global economy witnessed another commodity price[5] spike (commodities super-cycle). The emergence of this price surge resulted significantly from a combination of events – the decisive shift in the customer base of the industry towards emerging economies due to the rapid growth that was taking place in those jurisdictions as well as the increasing role-play of mining companies from emerging economies in the global industry (Humphreys, 2018). This commodity boom also catalysed some important changes in the mining industry, which included a move away from contract pricing towards spot pricing that resulted in increased volatility in mineral prices; increased operating and capital cost pressures resulting from resource depletion and tightening environmental standards; and continuing pressures on the resource sector from a resurgence of resource

[3] Mineral resources opportunities served as one of the major attractions that encouraged colonial masters to take over these many developing mineral-rich societies.

[4] Major mining investors/companies were mainly from colonial home countries - USA, Britain, France and Belgium.

[5] It was initially limited to hard rock and energy commodities, but after 2005, the soft commodity sectors began to be affected.

nationalism and protectionism (Humphreys, 2018). In the midst of the upward commodity price boom, another unique trend that seemed to occur was that the prices of manufactures were progressively more stable in comparison with the volatility of commodity prices (Morris *et al,* 2012a).

As it was the characteristic of the price boom conditions of the post-colonialism era, this recent boom era was also characterised by the increase in RN and protectionism (as mentioned previously), with both governments and private enterprises expressing increasing interest in claiming greater portions of the bounty (Sergeant, 2013). This tussle has proven not to be easy because this era was also still bemoaned by claims of the host citizens of mineral-rich States that they did not receive adequate economic benefits from the boom. Hence, host governments of mineral-rich countries sought "to obtain a greater share of the benefits of the boom for their citizens and greater direct controls over the development of the local industry" (Humphreys, 2018). The expression of RN took many forms, which included "widespread increases in taxes and royalties; the review and reopening of existing mining contracts (with a view to imposing more onerous terms); restrictions on foreign ownership; mandated shareholdings in new projects for indigenous investors; the blocking of foreign companies from investment in projects or commodity-deemed strategy; and requirements for local beneficiation and/or export restrictions for unprocessed minerals" (Humphreys, 2018). In this current era, it is noteworthy that, even though "most of the instances of RN occurred in emerging economies, they were by no means confined to these countries[6]" [*idem*].

Despite the volatility of commodity prices and the sharp price-fall experienced after the 2008 global financial crisis, commodity prices appeared to pick up and were on a sustained upward trend for about a decade (Morris *et al,* 2012a). By implication, it appeared that prices were likely to remain high and, in many cases, grow for some years to come[7] (Dobbs *et al*, 2011; and Farooki and Kaplinsky, 2012). However, the opposite became true.

Following the boom (especially from about 2014/2015), the climate that the global mining industry has been operating in more recent years has been more austere and characterized by some of the following:

6 For example, the indication of increasing RN drive is occurring even in the country which was once the champion of the free trade system – the USA.
7 This meant that the boom could have been more long-lived than that of the 1960s.

1. A continued shift[8] in demand towards emerging economies (going well into the future), albeit at a slower rate;
2. commodity prices continuing on a downward swing, which has resulted in shrinking margins and impairment provisions;
3. Markets being more focused on the short-term, thereby making an already difficult task – long-term business planning – even harder;
4. a greater rise in price volatility[9] that has led to increase in miners' weighted average costs of capital, because of the perceived business risk and increased compensation expectation of shareholders for the assumption of greater risks;
5. increasing uncertainty over future commodity prices, which has and is greatly affecting those considering large capital-intensive investment projects and facilitating a continued declining trend in market capitalisation[10] of many companies;
6. In the face of lower commodity prices, costs increasingly being put under greater pressure, thereby leading to problems of lower cash flows and high levels of corporate debt. Hence, companies have been forced to adjust[11] their behaviour to deal with these problems; and
7. Mining companies desperately needing to improve productivity in order to address the demands of both the global and local mining environment (Humphreys, 2018; Cornish, 2015).

These 'adverse' realities being experienced by the global mining sector, especially from 2015[12], appeared to have strengthened the expectation (that was envisaged even before the end of the recent boom) that pressures for resource nationalism would ease once the boom subsided,

8 According to the main forecasting agencies such as the IMF, this continuous shift in the location of global commodity trading towards emerging economies is because that is where major socio-economic growth and development is expected in the coming years. This is as a result of these countries being at a material-intensive stage of development, where their growth is heavily concentrated on building, infrastructure and consumer durables like white goods and cars (Humphreys, 2018).

9 The rise in price volatility has been fueled by the less transparent and less predictable feature of the new customer base, (which is partly because the small companies from emerging economies that have been major active players in this era do not have the same reporting requirements as large ones). Also, rise in price volatility is because more demand is concentrated in countries that are opaque in their nature and where the state plays a more prominent part in economic management (Humphreys, 2018).

10 In SA, for instance, "market capitalization for the top 35 companies declined to R414 billion as at 30 June 2015 (compared to R675 billion as at 30 June 2014). The decline continued when compared to market capitalization as at 30 September 2015 of R304 billion, resulting in an aggregate decline of R371 billion when compared to 30 June 2014" (Cornish, 2015).

11 According to Michal Kotze, PwC African Mining Industry Leader, "the message to miners is clear: 'Continue to focus on costs, refocus on your core business and carefully evaluate growth opportunities.' It certainly will make for some interesting planning and forecasting discussions in the coming year" (Cornish, 2015).

12 Andries Rossouw, PwC Assurance Partner said that the "financial performance for the South African mining industry in 2015 was extremely challenging and downcast" (Rossouw, 2015).

as was the case after the commodity boom of the 1970s[13]. However, the opposite has been the reality. Despite the increased downward pressure on profitability of the mining sector, the prevailing global tendency now is still increasingly more towards RN and trade mercantilism, with international trade and cross-border investment flows slowing down (Humphreys, 2018). Added to the increasing rise in RN of the present era, is the increasing rise of Chinese presence and financial activity in the mining sector, despite the fact that the post-boom occurrences had set back the global ambitions of many of the companies from emerging economies. The Chinese companies appear to be seeing the lower asset valuations from the humble/downcast status of the mining sector as an opportunity[14] to be taken advantage of, thereby causing them to push on with their expansion plans (Humphreys, 2018).

Although it was/has been expected that from 2018, favourable market conditions, higher commodity prices, increase in value and growth opportunities[15], coupled with stronger internal discipline will occur, it is unwise to expect issues like the rise in RN, protectionism and advancement of Chinese expansion strategies, to change any time soon (PwC, 2018). This is because a commodity boom implies that there will be more largess for host governments and mining companies to battle to acquire greater share. Hence, both mineral-rich States and mining industry players have to effectively address[16,17] the numerous challenges and risks that they are facing.

Going forward, this leads to fresh calls for greater participation by mineral-rich States in the affairs of mining and a (global) search for a new meaning of *Resource Nationalism.* Howbeit, it is expected that the current expression of RN must be carried out in the context of the evolving meaning and implementation of sustainable development.

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13 The current experience has differed from the post-1970s boom in several ways like in the fact that:
1. a significant portion of the world's minerals currently come from mineral-driven economies than was the case in the 1970s. The public policies of these countries are more focused on how the mining industry can contribute to their national socio-economic development rather than seeing mining as a source of raw materials for the local economy (Humphreys, 2013).
2. The current global geopolitics is significantly different from that of the 1980s and 1990s, which was characterized by a widespread tendency to privatization and marketization (Humphreys, 2018).

14 According to National Bureau of Statistics (2016), "in the decade up to 2015, China accumulated around $140 billion of foreign mining assets. This equated to 13% of China 's total stock of foreign assets". White and Case (2016) added that "between the start of 2015 and the middle of 2016, Chinese companies closed 20 cross-border mining acquisitions worth approximately $8.3 billion, these all around the world".

15 These expected increase in value could tempt the major industry players to reinvest in the mining business, pursue investment or growth opportunities and enhance shareholder returns.

16 The way to address these challenges and risks would involve finding how to increase the size of the pie so as to create more value for all stakeholders in an environment that is currently being characterized by ever increasing costs, reducing margins, increased volatility, increasing RN drives and Chinese 'take-overs' (Humphreys, 2018).

17 "Creating an environment with adequate infrastructure, less policy and regulatory uncertainty, and a skilled yet flexible workforce should go a long way towards attracting investment and benefiting all stakeholders," concludes Kotze (2015).

Table 2.1: Historical events that led to the emergence of the RN concept.

ERA	GLOBAL EVENTS	STAKEHOLDER RESPONSES TO MINERAL DEVELOPMENT
Pre-World War II/Colonial era	Colonial authorities issued mining titles to concessionaires for the extraction of minerals.	Colonial governments used minerals extracted for the manufacturing of finished goods and realized financial benefits from royalty payments[18] made by concessionaires.
Post-World War II and independence: 1950s	Widespread rapid economic growth and development was experienced, leading to increased demand for natural resources – minerals, fuels and oil, as well as soaring of commodities prices to significantly high levels (Kumar, 1995 and Morris *et al*, 2012).	The existent structure of the industry, the substantial resources of companies[19] and the power wielded by home governments of investors, enabled them to reap more substantial benefits[20] from the boom.
Post-Independence: 1960s	China developed bonds with the many of the newly independent governments[21] and offered economic, technical, infrastructure and military support to them[22].	Many mineral-rich developing countries became discontented with their existing concessionary regimes in reaction to the 'upper hand' that was being enjoyed by investors. Also, host citizens raised more claims[23] of no receipt of socio-economic benefits from their mineral endowments.

18 At that time, royalty payments were viewed as instruments that provided assurance of constant inflow of funds to the government as long as there was production or sale of mineral products.

19 The substantial resources of companies included technology, the control over markets and sources of supply.

20 They were also able to maintain dominance in the mining industry and had strong bargaining positions in comparison to host governments.

21 Asia, Africa, the Caribbean and pacific countries.

22 According to Muekalia (2004), the aim was to aid wars of national liberation and revolution, as well as the formation of an international united front to combat colonial masters.

23 These claims were premised on the notion that their governments were being too generous to mining investors at their expense.

Table 2.1: Historical events that led to the emergence of the RN concept (*continued*).

1970s – 1980s	In response to the complaints of citizens plus the China-inspired revolution, the host governments of mineral-rich developing states focused on bringing about significant changes to the structure of the regimes governing mining investments in their states. They expressed their RN drive by progressively developing new codes, foreign investment laws and tax legislations.	Many of the newly independent resource-rich states became more conservative (socialist). The policies they pursued were fixed at controlling the 'commanding heights of the economy' by experimenting with state ownership[24] of plantations and the mining sector (Kahn, 2013).
1980s	Capital flight from resource sectors resulted, as investors made significant divestments from these socialistic countries (Twerefou *et al*, 2007). Additionally, state-owned mining enterprises (SOMEs) were operated inefficiently[25].	The ailments of the SOMEs coupled with declining commodity prices and capital flight, caused the experiments of state-led approaches to begin to fail (Kahn, 2013).
Mid to late 1980s onwards	Extensive lack of investment by the governments, limited maintenance and modernisation of the industry, as well as declining production levels (Bank of Ghana, 2003), led to the rapid deterioration mineral resource industries. The mineral resources of these developing mineral-rich states were plagued with the underdevelopment during this period.	In order to resuscitate the failing mineral industry that was under government control, countries began to soften[26] their socialist attitudes.
1990s	Declination of commodity prices	Governments actively engaged in adorning[27] their mining legislative and fiscal policies

24 According to UNCTAD (1994a), by the late 1980s, about 70 percent of African mineral production was state-controlled, as opposed to 56 percent in Latin America and 33 percent in Asia.

25 This was due to lack of requisite capacity, weak institutional frameworks, political instability, the stresses of proxy wars, lack of skills, steadily falling commodity and increasing corruption.

26 This was carried out by refuting the policies of the post-independence era, which were characterized by strong state involvement in the industry. The governments began to engage in negotiations for possible privatization of their state-owned mining enterprises (Mainardi, 1997). The new era became one of restructuring, reformation and modernization of the mining industry, so as to become more outwardly inviting, pragmatic and promotional (Bloch and Owusu, 2012).

27 This was done by providing various tax reliefs.

2.2.1 The meaning of Resource Nationalism

With the call for RN gaining increasingly ground around the globe, it is imperative to fully understand what the term means. Research appears to show that the term does not seem to be a single workable definition. Also, the many attempts at defining the term makes its many definitions appear as being quite imprecise. In order to arrive at a concise meaning of the term, various definitions would be highlighted and explored.

First of all, Oxford Dictionaries (2012) explained Nationalism as *"a patriotic feeling, principles, or efforts; an extreme form of patriotism marked by a feeling of superiority over other countries; advocacy of political independence for a particular country".* Therefore, in this context, Ward (2009) described RN as *"...government's efforts to maximise revenues from and exercise greater direct and increasing State control over the economic activity of exploiting natural resources...A key priority being to enshrine the right to the full and independent expression of territorial sovereignty. Also, too was the right of developing countries to control fully the activities of multinational corporations in their territories".*

According to Dargin (2011), RN's origins lie in Spanish colonial philosophy and other definitions of RN include:

"...the phenomenon of sovereigns seeking to assert greater control over and ownership or revenue stakes in the extractive process by setting or hanging contractual or regulatory terms for foreign resource extraction companies...it is appropriate to use the term 'nationalism' since in addition to states seeking additional revenues they are also responding to populist, often emotive calls for greater local control over finite mineral resources…" Oxford Analytica (2012);

"…*Nations trying to make the most of their endowments…*" World Economic Forum (n.d.);

"…*a situation where producer countries want to maximize their revenue from present day's commodities production, for future investment or output*" (Unknown author, n.d.).

Based on these different definitions, Cawood and Oshokoya (2013a) defined RN as a *"sovereign claim on resource assets by citizens of a mineral-rich country, in which this claim must deliver maximum benefits to them".* From these definitions, the common elements that can be gleaned out for characterizing RN seem to revolve around greater state ownership and control over national assets like mineral resources. Based on earlier lessons on expropriation or nationalization of large-scale mining investments in the 1970s, these common elements give effect to the international premise of National Sovereignty over Natural Resources (NSONR). The NSONR ideology can be inferred to as implying that "natural resources are part and parcel of host countries and they can do whatever they want with their resources" (Dargin, 2011). The term 'sovereignty' seems to conjure up visions of the powers that create an independent nation to some, while to others, it conveys nightmares of a national justification for confiscating private assets and earnings (Otto, 1995).

As mentioned earlier, the philosophy of RN is becoming more important and gaining momentum globally, just like in the post-colonial era. However, the expression of RN today is quite different from that of the 1960s, which was characterized as a reaction to colonization and high commodity prices (Cawood and Oshokoya, 2013a). Currently, according to Dargin (2011) and Oxford Analytica (2012), RN drive is influenced by more factors[28]. Additionally, it can be deduced that the mode of expressing RN has a range of options available; with extreme variations existing at opposite ends. The next section seeks to expound on some of the various ways in which RN has been expressed in mineral-rich states all through history.

2.3 DIFFERENT MODES OF RESOURCE NATIONALISM EXPRESSION

According to Sergeant (2013), RN can "ultimately be reduced to a sombre analysis of the simultaneous, and very different, interests of capital, labour, and government". Any country experiencing general prosperity is most assuredly one in which conflicts between these three interest groups exist. The interest group that presides over the ownership and control of natural resources determines where the proceeds from the development and export of these resources

[28] Factors include:

- Governance and trends in politics where there is more government sensitivity to the public's perceptions and misgivings about foreign involvement in strategic sectors;
- increase in international oil prices and Arab spring in the last decade;
- Increasing OECD country concern over the economic significance of sovereign wealth funds;
- Practical efforts to measure socio-economic development contributions of extractive sectors;
- Balancing an enabling environment for responsible business practice with immediate economic interests by governments seeking to increase their share of profits, bilateral relations and diplomatic ambitions.

will be concentrated (Weinthal and Jones Luong, 2002). Along with the privileges to determine where the proceeds are concentrated, comes the prerogative to exert the (political) influence and the superior bargaining power of the interest group. With the implications that these have on institutional and policy outcomes in resource-rich states, it is ideal that the conflicts of interests be nonthreatening and not malignant. This can only happen if each of these interests attempts to maximize its objectives under the discipline of checks and balances provided by a country's fair and equitable executive government, legislature, and judiciary system. The result of this would be an optimum outcome whereby each of these interests are 'ring-fenced' from each other but still enjoy its own rights, and also remains subject to its duties and responsibilities. On the other hand, if one of the three interests goes out of control, the consequences can be disastrous. From historical experience, the most common culprit of situations where interests go out of control has been government, or its proxy, such as an autocrat. One example of a case (amongst many other examples) in which government went out of control in terms ownership and control of natural resources is that of Bolivia in the 1930s and 1970s (more details about this case can be found in Chang, Hevia and Loayza (2010), pages 8 – 11).

Hitherto, the vague nature of the meaning of RN often afforded it to be confused with resource nationalization. However, resource nationalization is only one of the main extreme variations of RN. Resource nationalization and other forms of expressing RN would be discussed hereinafter.

2.3.1 Resource Nationalization

As mentioned earlier, resource nationalization is one of the extreme variations of RN. Post-independence, it was the option taken by many developing resource-rich countries to express their RN objectives. The fact that the vast majority of mineral assets are immobile before extraction and basic processing, as well as state-ownership appearing to guarantee that the proceeds from mineral resources would be concentrated within the State, has made mineral assets very attractive and favourite targets for predatory executive governments. Also, because State-owned companies of any kind are immune from takeover, this further makes the choice by an executive government to establish itself as the dominant party in the management of mineral resources, an appealing one (Sergeant, 2013). In light of these, resource nationalization can be referred to as the predominance of government in ownership, control and running of any industry. According to Du Plessis (2013), it can be described formally as "the compulsory acquisition by the state of previously private firms".

Resource nationalization stands on three main pillars. According to Sergeant (2013) and Weinthal and Jones Luong (2002), they are:

1. The status and prestige (perceived or actual) that goes with government ownership of mineral extraction firms;
2. The attraction of the additional monies (real or imagined) that government can appropriate from mineral extractive firms; and
3. The assurance that as the proceeds becomes more concentrated in the state, so also will the key actors involved in decision-making be concentrated within the state.

In most surveys, it has been found that resource nationalization is more common in countries where the economy[29] (and hence the tax base) is heavily dependent on one or a few commodities (Kobrin, 1984; Minor, 1994). Examples of countries that took an outright resource nationalization path include Bolivia, Venezuela, Uzbekistan (Humphreys, 2018). Several case studies have been conducted to assess the success or failure of resource nationalization. These surveys have shown both positive and negative experiences of public ownership on the rapid industrialization and economic development of their states (Tanzi, 2000; Easterly, 2001; and Du Plessis, 2013). Table 2.2 gives a summary of the basis on which both pro- and anti-nationalization proponents argue their positions, as well as the various examples and implications of each.

Examining the impact of nationalization through case studies have shown varied experiences, which indicates that there is no 'general case' of nationalization, but there are ardent arguments for or against it. The cases studies are also not able to provide the answers because of their inability to "isolate the particular effect of the change in public ownership from the many other changes that are necessarily occurring in any actual historical case" (Du Plessis, 2013). This is due to the fact that many other factors idiosyncratic to each country have contributed to the

[29] In such countries, the governments are very prone to push for nationalizing the sector, due to wrong expectations from its 'fortunes'. The exhibition of a culture of rent seeking, corruption, and impunity, which are inspired by these 'fortunes' often lead to the breakdown of the relationships between government and capital.

realization of successful or unsuccessful nationalization stories[30]. The international experiences that provide evidence of the risks associated with countries that ply the resource nationalization path show that the lowered support for the key market-based institutions cause such countries to be eventually classified as ‘failed states’ (Du Plessis, 2013 and Sergeant, 2013). This general examination also suggests that there are common factors[31] that cut across the cases where SOMEs failed. Additionally, pro-nationalization arguments appear to be largely fiscal and ideological as they have not explicitly suggested that the economy will reap great efficiency gains from this action.

Internationally, only when there is clear financial benefit and presence of an accountable government would nationalization be more likely to exist on a long-term sustainable basis. Learning from this is highly important for mineral-rich developing countries where the topic of resource nationalization could critically affect their process of economic development.

[30] This indicates that no pro-nationalization case can be accepted as a general prescription for supporting the use of resource nationalization indiscriminately, in all countries and at all times.

[31] Some of the common factors which contributed to the failure of their SOMEs lie in:

i. from abuse by predatory executive government, their resistance and/or prevention of appropriate reinvestment and capital expenditure (capex) in the formerly productive mining assets (Sergeant, 2013);
ii. complaints of steadily falling production/ stagnant output, even in times of sustained bull market in commodity prices;
iii. increasingly failure to address overall skills challenges within the group;
iv. milking of profits at the expense of reinvestment and expansion;
v. operating under inefficient business models;
vi. political instability;
vii. accumulation of substantial legacy of jobs unlikely to be tolerated by a competitive private sector enterprise; and
viii. Steep-rising costs.

Table 2.2: Arguments of pro- and anti-nationalization proponents.

	Pro-nationalization proponents	Anti-nationalization proponents
Arguments	a. Expectation of greater fiscal benefits[32] from nationalized resources sector that exceeds tax revenue from private firms by a sufficient margin and can compensate for the costs of nationalization (Du Plessis, 2013); b. Potential of SOMEs to have lower price elasticity of supply than private mining companies, possibly because of their functional role in achieving social and commercial policy objectives of the government as well as their greater involvement in countertrade and long-term supply agreements (Mainardi, 1997); c. Existence of a business model[33] in which the competing	a. The mining sector is competitive and therefore a poor candidate for public ownership (Du Plessis, 2013); b. The significant revenue potential of the extractive sector makes its management to be highly susceptible to the risks of fiscal imprudence[34]; c. Nationalizing competitive private industries very likely leads to less efficient SOMEs[35]; d. the creation of nationalized firms stands the chance of creating dependence on governments and becoming great financial burdens[36] to them; e. the beneficiaries of nationalization are often concentrated in organized labour and/or political elites[37];

32 Greater fiscal revenues are expected from SOMEs' profit margins because it is assumed that they enjoy comparatively lower costs of production than private mining companies (Mainardi, 1997). Lower costs of production are derived from lower energy costs, economies of scale, their access to higher average grade deposits and their protection against the effects of slumps in international prices for minerals.

33 In the business model of SOMEs where the imperatives of capital and labour are acknowledged, such governments show the willingness and ability to manage their mineral assets on a long-term sustainable basis. This is done by optimizing production while also paying attention to and taking specific actions on other underlying efficiency factors such as reinvestment and expansion (Sergeant, 2013). With these SOMEs being independently managed, their operations have been allowed to run very efficiently just like the business models of competitive private sector enterprises.

34 Fiscal imprudence comes into play when the systems for checks and balances in these countries are incapacitated to curtail government excesses (Du Plessis, 2013). This might the give answer to the question of why state ownership seems to be largely responsible for generating outcomes such as excessive spending, unbalanced economic growth, and weak institutions that are seen throughout developing resource-rich states (Weinthal and Jones Luong, 2002).

35 This occurs because fiscal imprudence and lack of competition places them in a state of complacency (Sergeant, 2013).

36 This arises when government-sponsored debt is used to bail out SOMEs during times of commodities price down-cycles, thereby placing heavy calls on taxpayers.

37 In a democratic system, when labour is politically aligned with government, as the demands of the employees of SOMEs increase, experience has shown that governments respond by obliging them. The governments do this in order to preserve short-run political interests and benefits, at the expense of longer-run economic efficiency.

Table 2.2: Arguments of pro- and anti-nationalization proponents (*continued*).

	interests of capital, government, and labour are accepted, respected and professionally managed; d. SOMEs' ability to expand production and improve local technological know-how, through a better interaction with foreign and local producers (UNCTAD, 1994a; and World Bank, 1992); e. Nationalization can be a justification for solving the risk of market failure.	f. Large SOMEs lose international competitiveness and become outdated technologically (Mainardi, 1997).
Examples	Norway, Sweden, Chile, Brazil and Mauritania, East Asian countries like Korea and Singapore	Latin America – Venezuela's PDVSA, Chile's Codelco (despite its pro-nationalization success story); and Africa – DRC and Zambia
Implications	In situations where governments have dominant role in running the industry, 'all parties win' cases are possible.	Rising of government debt and further calls on current and future taxpayers to bear these costs (Pint, 1990). The ripple-effect of this is that the cost[38] to the economy will go beyond the mining sector and government finances.

[38] As capital and labour are forced into complete subservience, investment across the board will be affected as capital market interest rates become higher and the balance of payments comes under more strain. As a result,

i. Economic growth will be lowered and international investment will be discouraged as capital, which is mobile, readily and quickly shifts to other jurisdictions;
ii. Employment growth will be invariably curtailed, as labour, which can also migrate, has the potential of weakening and impoverishing this factor of production (Sergeant, 2013);
iii. There will be a rise of inequality, especially when the windfall gains from high commodity prices are perceived to be distributed unequally (Chua, 1995; Chang et al, 2010).

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2.3.2 Resource Privatization

The previous sub-section on nationalization appeared to indicate that it is not resource wealth that stunts economic growth and facilitates authoritarian rule, instead, State-ownership of resources that is not managed properly tends to lead to these negative economic and political outcomes. The question then arises as to whether private ownership of natural resources will have a reverse effect (Weinthal and Jones Luong, 2002).

Usually after a period of mixed-results (mostly failed) nationalization of mineral industries, what followed was a swing towards privatisation. However, some governments choose privatization from the onset of the discovery of mineral resources. This can be seen as another means by which countries express RN. By ensuring that their jurisdictions are attractive to significant amounts of private sector capital, the privatization option is usually preferred so as to resuscitate the moribund mineral assets or to prevent complacency of the mineral development from the onset. Proponents of privatization argue that it allows for more efficient economic policies and resource management, if finer checks and balances from Non-profit government organizations (NGOs) and other interest groups, are allowed. They also highlight that privatization frees up fiscal resources, because the industry is not reliant on government finances and government does not have to use scarce State resources. Even in cases of where the private sector runs concurrently with SOMEs, the effect of the presence of loss-making public enterprises on government expenditure would not be as significant as compared to instances where the mineral assets are entirely nationalized. This implies that lower government debt would be realized, with an associated lower interest burden on the budget. Subsequently, government's resources would be available to pursue its many other goals (Du Plessis, 2013). Additionally, Ross (1999), Wantchekon (1999), and Jones Luong and Weinthal (2001) have suggested that privatization offers resource-rich States a potential path out of the 'resource curse'. However, Weinthal and Jones Luong (2002) opined that this only occurs when ownership is transferred to domestic interests and not to foreign investors, because this enables the states to enhance their capacities and build viable tax regimes.

Investigations that have used different proxies of efficiency to assess[39] the consequences of State-ownership for productivity growth and cost-increments, have found out that the private

[39] This assessment was done in the context of controlling for size, market share, and other firm-specific features as well as macroeconomic features that might impact on the selection of ownership.

firms are significantly more profitable and more productive than either mixed or outright State-owned enterprises (Ehrlich *et al*, 1994; Tian, 2000; Mujamdar, 1996; and Chong and Lopez de Silanes, 2005). Several other relevant bodies of literature on resource-rich States including those on economic reform and environmental regulation have stated that in general, countries that have allowed private enterprise to thrive see labour and government mostly benefiting. Weinthal and Jones Luong (2002) generated several testable hypotheses, which were applied on some of the energy-rich States of the former Soviet Union — the Russian Federation, Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan, who had employed varied RN approaches to resource ownership and development. The hypotheses linked "the structure of ownership over natural resources to the design of an institution that is critical to both economic growth and political liberalization" (Weinthal and Jones Luong, 2002). Furthermore, empirical data to test these hypotheses were obtained and tests were carried out on Russia and Kazakhstan, specifically. At the end of their investigations, their findings indicated that generally, there was more support for privatization over nationalization, as privation appeared to offer a potential path out of the 'resource curse' of resource nationalization. However, they specified that a peculiar type of resource privatization – one that involves a transfer of ownership to domestic interests – is what would yield the desired "win-win" outcome in terms of adequate sharing of resource benefits (Weinthal and Jones Luong, 2002). The Russian Federation's model of privatization of its energy sector to domestic capitalists, with a minimal amount of international involvement, was cited as a good example of their pro-privatization findings (more details can be garnered from Weinthal and Jones Luong (2002)).

These results are consistent with claims that nationalized firms are more inefficient than their competitive private establishments prior to nationalization. Nonetheless, this claim was studied by Kole and Mulherin (1997) using another natural experiment and their conclusion was that the inefficient performance of nationalized firms only arises when they start to operate with different goals and less competition than their private sector predecessors. It must also be noted that if previous elites (most especially members of the former predatory executive government) are not held in accountability, the privatization process itself could be severely undermined by corruption (Sergeant, 2013). A few countries[40] in the Africa have promoted joint ventures between the private sector and the government, while some[41] have allowed full private

[40] Countries like Botswana, Gabon, Ghana, Guinea and Niger.
[41] Countries like Namibia and Sierra Leone.

ownership of mining operations (Mainardi, 1997). International experience has shown that there are few success stories of nationalization as compared to privatization strategies.

In addition, a developing trend that appeared to mainly stem out from the most recent commodity boom, was/is the growing tendency for rising powers such as China, to seek greater control and monopolization of resource markets, in the name of resource privatization (Burgess and Beilstein, 2013). China's aggression and competition against other superpowers like US and Britain, for strategic minerals from developing mineral-rich States, is fuelling the discuss on the 'new'/emerging concept of Resource colonization. An expatiated discussion on the subject of 'resource colonization' is out of the scope of this study but more details can be found in Burgess and Beilstein (2013), War on Want (2016), and Robyn (1998).

2.3.3 Mineral Taxation

As an outflow from the choice to allow the mining industry to be privatized, the governments that decided this path usually use a combination of licence conditions and taxation of the industry as their way of expressing RN. Mining taxation, which is a subset of the overall tax framework of a country, is not a new phenomenon. Like taxation of other sectors of the economy, the main function of the mining taxes is to capture and generate revenue for the host government as well as being used in some cases to encourage or discourage some economic activities.

It is important to note that various mining tax approaches have been used over time to capture economic rent from the sector. These levies have also had an effect on the returns to equity holders, thereby affecting the level of investment and production decision-making processes in the industry. This has led to the issue of rent-sharing between the host government and the investor. The argument to specially treat the taxation of the mineral sector (due to its unique characteristics[42]) in comparison to the taxation of other economic sectors also strengthened the fact that the design and administration of mining fiscal regimes has been tricky, challenging

[42] Some of these unique characteristics of the mining industry include: the risk and uncertainty associated with geological conditions; the fixed single purpose nature of the investment; large minimum economic scale of production requiring large capital investment; the exhaustible nature of the reserves and significant environmental impact of the mining industry; cyclical nature of the industry; as well as the special case-by-case contractual arrangements for mining projects over the years.

and dynamic. These special factors have required special ingenuity in devising the fiscal regime for mining over the years.

Before the current state of mining taxation with respect to RN can be discussed in detail, it is important to "trace the generational evolution of mining tax regimes and provide an analysis of forces and causes which led to this evolution" (Kumar, 1995). Details of this evolution are given in Table 2.3. After World War II, the changes in the fiscal regimes of developing mineral-rich countries were carried out through a variety of means leading to hybrid fiscal regimes that combined royalties with taxes on profits as well as a range of other general levies. According to Kumar (1995), there were key changes and developments in the fiscal terms of both mining and petroleum agreements as well as in general legislation. It may be noted that these developments and increased demands by government in that era, changed the relative bargaining stances of foreign investors and mineral producing countries. As the financial positions of host governments were significant improved, this fuelled conflicts between the governments and the holders of mineral rights. The net effect was the enormous discouragement of investments in the mineral sector. The investor-friendly developments of the 1990s led to a shift of risk away from the entrepreneur, thereby enabling them to accept higher rates of taxation and gave them desired incentive for exploiting marginal deposits.

With lessons learnt from the inefficient expression of RN in the post-world war II and independence era, many governments of developing countries are currently working to put in place well-designed and administered fiscal systems. In doing[43] so, the goal now is to allow for the effective maximization of the government's take without jeopardizing levels of incoming investment. Hitherto, the drive is towards making the mining fiscal regimes simpler as well as relaxing the fiscal burden on investors. In order to achieve this, the establishment of stable fiscal regimes[44] that balance and satisfy both investor and host government objectives across business cycles, should reached.

[43] With the issues of sharing of the cost of the environment between the mining industry and society needing to be addressed coupled with handling the issue of the cyclical mining business, the reformulation of mining fiscal regimes that are in strict adherence with the principles of taxation, has re-emerged.

[44] This provides that investors should be willing to accept that a larger proportion of the revenues would accrue to the government during boom years, while governments should be willing to relax their regimes in lean price years.

Table 2.3: Evolution of mining fiscal systems from Pre-World War II/independence era to post-2000s era.

ERA	FISCAL TERMS IN PLACE	IMPLICATIONS
Pre-World War II and pre-independence era	• Contractual agreements between sovereigns and concessionaires[45] for the payment of royalty taxes (computed on the basis of production with the volume of ore sold being used for the purpose of assessment or on the basis of production without regard to the ore being sold), nominal mining land rent plus initial bonus payments to the sovereign for the concession (Kumar, 1995). • Income taxes scarcely existed in developing countries. • Infrastructural development[46] was carried out by large mining operations at their own expense and directly out of their profits.	• Governments liked royalty payments because of the simplicity of its administration and its provision of steady income. Investors also favoured this regime because the dues payable were transparent as costs were easy to ascertain and it seemed to satisfy some of the principles of taxation[47]; • The fiscal burden was generous as royalty rates were relatively low in many cases.
Post-World War II, 1970s, early 1980s	• A shift from royalty payments as the predominant form of taxation to the introduction of new levies such as income taxes, custom duties etc. Many existing mineral agreements either replaced royalty payments with income tax payments or used levies on income as add-on to royalties. However, royalties did not disappear completely in many agreements because of their advantages to government. • Growing acceptance of *ad valorem* form of royalty, where royalties based on production volume were replaced by royalties based on prices paid in convertible currencies.	• In expressing sovereignty over natural resources, the receipt of a larger government 'take' and fairer distribution of economic rent between the host government and the private investor, became the goal. • Developments[48] in the petroleum industry plus depressed prices of minerals and metals from the world-wide economic recession further influenced governments to reappraise and accelerate changes to their own existing petroleum and mineral fiscal regimes, policies and arrangements.

45 Concessionaires were granted exclusive rights to search for, obtain, exploit, develop and extract minerals for domestic sale or export.
46 Infrastructures like means of transportation, water, power, port facilities as well as housing and other amenities for mining workers and host communities.
47 Some principles of taxation are equity, efficiency, neutrality, convenience and certainty.
48 Organization of Petroleum Exporting Countries (OPEC) decided to unilaterally raise petroleum prices so that between 1973 and 1974, oil prices quadrupled.

Table 2.3: Evolution of mining fiscal systems from Pre-World War II/independence era to post-2000s era (*continued*).

	• Reinforcement of the determination of host governments to increase their participation in mineral development. • Introduction of withholding taxes, additional profits tax (APT) or Resource rent tax and windfall profits tax, aimed at directly addressing booms in mining cycles. Diminished scope of tax exemptions, tax holidays and much of the special provisions for writing off capital costs from some agreements.	
late 1980s to early 2000s	• New forms of revenue collection appeared in the mining sector including profit-sharing or equity participation, production-sharing and service contracts. • Mining legislations and tax terms became more investment-friendly, with the occurrence of some innovative developments[49]. • Other pertinent issues like the impact of mining on the environment, health and safety received attention, as additional taxes. The significant impact of environmental costs on the size of economic rent further opened up greater debate between the mining industry and society.	• The effect of the recession[50] of the mid-1970s on government revenues and the financial positions of mining companies made developing states to soften their nationalistic attitudes; • The result was fierce competition between among nations for a static pool of potential investment funds, generally referred to as "the race to the bottom".
post-2000s	Pursuit of finding the most favourable mining fiscal regime continues, which includes: • A shift from using tax stability clauses or guarantees against new taxes, changes	• The commodity price boom increased mining investments; • These investments resuscitated the expectation[51] of benefits-

[49] According to Kumar (1995), the innovative developments included:
a. the demand for a guarantee of tax stability in mining agreements;
b. granting of tax reliefs and deductions such as tax holidays to secure foreign investment; and
c. lifting of payments like customs duties or refunding them for capital equipment or for goods that favoured local processing of the mineral or giving of exemption until capital recovery

[50] In the economic recession of the 1970s, there was a fall in real terms of commodity prices, almost stagnant levels of consumption and falls in world supply, mainly due to the failure of SOMEs to provide adequate delivery of mineral production.

[51] Their expectations were premised on the principle that it was the constitutional right of the government not only to have control over the natural resources of the states but to obtain a reasonable and fair share of any returns from the user of those resources (by levying the users).

Table 2.3: Evolution of mining fiscal systems from Pre-World War II/independence era to post-2000s era (*continued*).

	in tax rates and rules for calculating taxable income; • Limiting tax reliefs, holidays and deductions granted to secure foreign investment to deductions for project-related expenditures, capital allowances and moderated tax rates during the initial phases of the project; • Fewer (almost absent) depletion allowances from the mining fiscal regimes of most developing countries; • the mining tax regimes of States taking into account the tax levels in other mining countries, so as to establish international competitiveness of their mining industries; • the move towards greater neutrality between the taxation of mining companies and that of other economic sectors, whilst taking into account the specific nature of the mining industry; • International considerations: With the extension of the reach of tax policy from national to international settings, this has led to the principles of inter-individual equity and the efficiency of resource use becoming more complex to apply.	delivery by host governments and citizens – a re-birth of the RN[52].

[52] This RN concept has become the common strategy adopted by the governments mainly owing to improper share of the resource benefits between the host nation and mining companies (Beroe Inc., 2013).

In summary, with the knowledge that "the severity of the fiscal regime to the investor has varied with the fortunes of the industry and individual country circumstances" (Kumar, 1995), it appears that the evolution of mining taxation has been a step in the right direction. In expressing RN, governments will understandably continue to prefer instruments that combine stability of revenue (e.g. royalty) with those that are progressive with regard to profitability (e.g. income tax, APT) (Otto, 1995). In light of this, observations around the globe show that in recent years, over 25 countries have moved to strengthen their policies[53] to support increase in their share of mining profits. This move has been prevalent and more rigid in developing countries than in developed economies. By this, RN has been stated as being one of the biggest business risks[54] for mining companies (as at years 2012 – 2013) according to a leading research firm (Ernst and Young, 2012). Furthermore, it could potentially serve as a strong deterrent to investments into new projects. Knowing that investments are vital for development of mining industry especially in developing economies[55], it is highly necessary for governments to develop a balanced approach when expressing RN. They need to rationalize their existing and proposed laws and regulatory frameworks geared towards optimization of revenue generation from mining investment, so that these frameworks provide an enabling, investment-friendly climate for mining companies to operate (Beroe Inc., 2013).

2.4 RESOURCE NATIONALISM, INDUSTRIALIZATION AND ECONOMIC DEVELOPMENT

One of the most remarkable events of modern economic science in history was the phenomenon of industrial revolution, which started in the late 1700s. This phenomenon led to the transformation of societies into their current modern state. According to Love (1994), "industrialization was a fact before it became a policy and a policy before it became a theory". Any society that moves along this path of economic development would be transformed every generation, with the following generation living very different and better lives than the previous generation(s). Hence, economic development can be defined as a process of transformation whereby a society not only realizes rising prosperity but is moving along the path of ever-

[53] Some of the methods adopted in developing economies to express RN in this fashion include higher taxation, increasing the mine royalty taxes, mandatory domestic beneficiation of unrefined ores and export levies etc.
[54] RN policies appear to pose significant additional costs for mining companies.
[55] Mineral-rich developing countries are prone to lack of sufficient domestic capital and technology despite the availability of abundant resource rich deposits.

increasing productivity (Du Plessis, 2013). In other terms, Morris *et al* (2012b) regarded (economic) development as essentially the thread or sequence of events that allow one thing to lead to another.

In the pre-depression industrialization era, economic development was impossible without a significant effort in the accumulation of capital. Whereas, the 'beauty' of industrialization of post-depression and post-World war II eras (till date) is that the tremendous rise in income realized since the beginning of the industrial revolution cannot be attributed to the use of more land, or to a more exploitive use of labour, or even to a rapid accumulation of capital (Solow, 1956; Easterly, 2001). Instead, the long-term prowess of this revolution is more dependent on raising labour productivity[56] (Caldentey, 2008). This means that the rise in wealth was due to neither working harder nor the use of more inputs, but to working smarter. Working smarter (an outcome of the current digital era, which started in the 1950s) involves the specialization, "adaptability and the use of technological inventions to improve the productivity of labour" (Du Plessis, 2013). The strategies contemplated for improving labour productivity involved the development of national capacities through investment in research, development, education, training, foreign technology acquisition, and public–private cooperation practices. Nonetheless, the industrialization-drive of the post-depression epochs also involved processes of capital accumulation, via the absorption of excess labour into the more productive sectors (Lewis, 1954; Rosenstein-Rodan, 1943). Also, this process that transforms the lives of its individual members and society at large, through rising labour productivity also requires far more extensive co-operation amongst them than was required in pre-industrial societies (Du Plessis, 2013).

Historically, many countries did not leave the promotion of domestic industrialization and the diversification of their economies (for the realization of economic development in their states) to the 'mercy' of market forces. Instead, their governments took the leading role in the industrialization process through the adoption of the 'developmental state' model.

[56] In addition to the use of tariff policies, subsidies and other controls, increased productivity through the use of technology and better intellectually competent people not just the increased number of 'hands', enabled the promotion of industrialization in the post-depression era.

2.4.1 The Developmental State

The concept of a 'Developmental State' was another form of expressing RN, which emerged particularly in the post-independence era. This concept typically refers to a government that intervenes and actively takes a leading role in guiding the direction and pace of the economic development of a country (Du Plessis, 2013). The concept is not an economic one and has its roots in the East Asian (Japanese in particular) success stories where governments played the leading role of promoting industrialization during the post–World War II period. It is mainly associated with the type of economic policies they used, which were aimed at developing selected productive sectors of economic activity. There are key characteristics[57] underpinning the concept of the developmental state.

Between 1950 and 1960, the Japan economic model involved the state engineering and monitoring its industrial catch-up process. It did this first of all by creating the Ministry of Trade and Industry (MITI) in 1949. The MITI provided developmental guidance and used tax incentives and public–private sector collaboration to create export industries, the production of consumer durables, and the creation of technologically sophisticated consumer products. Also, through the approval of the foreign capital law, it had the power to negotiate the price and conditions for the import of technology. By the 1980s, the MITI turned its attention to the development of high-growth technology industries. In South Korea's case, the government pursued a government-led, export-oriented policy via its Ministry of Commerce as well as the (recently created) Economic Planning Board. This enabled the government to adopt "an exchange rate policy that combined periodic devaluations and export subsidies to make the exchange rate competitive for local producers" (Caldentey, 2008).

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[57] According to Du Plessis (2013) and Caldentey (2008), a summary of key characteristics underpinning the concept of the developmental state include the following:

a. The developmental state was conceived as an interventionist state;
b. According to the concept, governments do not make heavy use of public ownership, instead, they try to achieve their goals through a set of instruments. Such instruments include tax credits, breaks, subsidies, import controls, export promotion, targeted and direct financial and credit policies instruments that belong to the realm of industrial, trade, and financial policy;
c. The degree and type of government intervention should vary over time in scope and content. For instance, state intervention was needed at the early stages to develop the product and the later stages to scrap the declining industries;
d. The developmental state requires the existence of a bureaucratic apparatus to implement the planned process of development; and
e. The developmental state requires the active participation and response of the private sector to state intervention.

Some of the countries in Latin America also adopted this concept by allowing governments to intervene in a number of areas via the use of fiscal, exchange rate, monetary, and sectorial policies. This facilitated the promotion of industrialization in the region. In the case of Mexico, the state facilitated economic development by, amongst other things, providing the best conditions for private investment without intervening directly in the productive sphere. They also participated in infrastructure projects, as well as ensuring social peace (Moreno-Brid and Ros, in press as at 2008). In Chile's case, the state's intervention stimulated the production of agricultural products, capital goods, and raw materials toward the end of the nineteenth century (Collier and Sater, 1998). However, they pointed out that intervention barely had any visible economic effect on the manufacturing of finished goods industries (Caldentey, 2008).

The developmental state was initially viewed as a type of development strategy used by governments to drive industrialization of their states, in a bid to catch up with more developed ones (Coates, 2000). However, Chang (2002 and 2008) and Ormrod (2003) showed that the "developmental state[58] and its associated policies were also present in the early development history of currently industrialized economies". This period of state-led industrialization took place from the Great Depression until beginning of the 1960s and the industrialization was dependent on import-substitution and achievement of sufficient amount of capital accumulation. The process of capital accumulation led to development through the absorption of excess labour into the more productive sectors and by raising overall productivity (Lewis, 1954 and Rosenstein-Rodan, 1943). It must be noted that developmental state policies were not conceived as rigid ones, instead they adapted over time to fit changing circumstances. They were also not "associated with a strong case for nationalization, or even large state ownership of productive assets" (Du Plessis, 2013).

By the beginning of the 1990s, this East Asian model of developmental states was criticized "on the grounds that its growth performance was attributed to factor accumulation and wasteful investment rather than total factor productivity" Caldentey (2008). This negative view against government intervention was supported by Washington Consensus' viewpoints and policies of deregulation, privatization, and liberalization initiatives (in 1990). Nonetheless, the

[58] The main areas in which government intervention were obvious include the building of infrastructure such as transport roads and railways; the protection of export sectors and specific products and industries via import and export taxes and provision of cheap credit; the spread of colonization; and the promotion of subsidized skilled labour immigration (Caldentey, 2008).

Commission on Growth and Development[59] (2008) cautioned against a preoccupied focus on the amount of government intervention at the expense of assessing the effectiveness of government intervention in facilitating the realization of economic development. The Commission further recommended that this intervention should follow "a risk-management approach to policymaking, which entails small policy adjustments that would allow reversals, if the results are undesirable" (Commission on Growth and Development, 2008). Therefore, government intervention in the process of economic development is still recommended and justified due to a shortcoming of market outcomes. However, the advice is that such intervention must not be sympathetic to nationalization (Du Plessis, 2013). Presently, it is apparent that it is a prime role for governments to be actively involved in the mechanisms for national reconstruction, poverty alleviation and the process for realizing economic growth and development in their states. Government's approach must also include the participation of all sectors of the population (capital and labour) or else they stand the risk of foregoing the long-term benefits of nation-building (Marques de Morais, 2011).

2.4.2 Resource-based industrialization through linkage development from the mineral sector

Relatively submerged in the RN policy response of using key sectors to stimulate industrialization is the issue of linkages into and out of the sector (Morris *et al*, 2012a). Reviews of historical accounts of state-led industrialization provide links between industrial development (vis-à-vis economic development) and resource extraction in the current resource-rich high-income industrialized economies (Morris *et al*, 2012a). During that period, developing mineral-rich states became increasingly concerned about the role of raw material production in promoting linkages for the purpose of increasing the added value of minerals, stimulating employment and transferring of technology (Otto, 1995). Many of the governments of currently industrialized economies used their public authority over their mineral (natural) resources and a variety of instruments[60] to foster resource-based industries, the manufacturing sector and knowledge-intensive services. However, it was observed that from the 1970s and

[59] The Commission studied the common features of the 13 East Asian post-war growth success stories.

[60] They enabled the growth of their non-traditional manufacturing sector and knowledge intensive services through synergistic links with the commodities production via instruments. These instruments included the use of public purse; the incorporation and mix of strategic tariffs - 'fiscal carrots' (e.g. faster depreciation, extra investment allowances) and 'fiscal sticks' (e.g. tax on the export of unprocessed material or guarantee of raw material supplies at favourable prices for new local facilities); targeted subsidies to specific firms, infant industries; and other protectionist measures such as distribution of monopoly rights, for the stimulation of industrialization and the diversification of their economies (Otto, 1995; Berry, 1990; and Chang, 2002 and 2008).

1980s, progress at least with respect to using fiscal instruments to promote domestic processing was limited. Examples of countries where the evidence of the synergistic links between manufacturing and the resource sector can be found include: the US, Finland, Australia and Norway (Wright and Czelusta, 2004). In Finland, the impacts on and from the development of the forest industry were chosen as the means by which the development of the national economy was set in motion (Rimler *et al*, 2000). In the Japan model[61], development and concentration of key domestic industries (energy and metal production) was fostered via the provision of wide-spread and cheap access to credit facilities (Caldentey, 2008). The capabilities developed in Japan's industries fed back into the production of commodities with the provision of better working methods and the adoption of the newer available technologies, which led to reducing costs. In turn, this enabled the exploitation of less well-endowed mineral seams, oil deposits, and agricultural land (Morris *et al*, 2012b).

With specificity to using the mining sector to stimulate industrialization and economic development, another main tool that governments have used is the legal system. By creating quality and reliable institutional frameworks which allow companies to 'safely' work, re-establishes private and foreign investors' trust in a country. This, thereby, makes such a country an attractive place to invest. This is particularly helpful for industries like the mining sector, which is strongly threatened by nationalization today. Nevertheless, even though legal stability is highly necessary, it is not the only sufficient condition[62] to stimulate the realization of investments in mining projects (Aroca, 2000). From the growth theories of the pre- and post-1950s, it can be drawn that the use of a key sector to launch economic development is not out of place. Consequently, many developing countries that aim at generating above-average increases in economic activity and stimulation of overall economic growth are currently looking to identify key sectors that will be useful for economic planning (Lenzen, 2003). The recent commodity price super-cycle with the prospects of its extension into the future, appears to provide added impetus for the extension of these linkages (Morris *et al*, 2012b). In the context of RN, this study seeks to explore possibilities of mineral-rich developing countries seizing the opportunity to use their resources to contribute to, diversify and develop their industrial capabilities.

[61] The Japan model used its MITI and the establishment of the Japan Development Bank to stimulate and foster export growth.

[62] Since mining business takes into account other long-term factors such as geologic characteristics, incorporation of new technologies that reduce the production costs, price perspectives, the mineral, political and economic stability of the country.

2.4.3 The concept of Economic Linkage Development

Hirschman (1958) postulated that economic development and structural change proceed predominantly along above-average linkages from identified key sectors. The development of these above-average linkages from the resource sector is expected to occur as a natural outcome of market forces. Subsequently, this should lead to acceleration in a relatively small number of industries. In turn, the amplification of small changes will initially be realized but eventually they will affect the whole economy. The result would be the development of linkages in general and local linkages in particular (Morris *et al*, 2012b). In this light, the development of linkages is seen to be an important vector for industrial and service sector growth, and thus economic diversification of local economies. Linkages provide the scope for promoting the spread of income and capabilities throughout the economy. In areas directly adjacent to resource extraction, these linkages would be "manifested spatially in the form of visible – and differentiated – clusters (i.e., geographic and sectoral agglomerations of enterprises) of mining activity" Bloch and Owusu (2012). The capabilities of these agglomerates would be developed as they appear to "benefit in different ways from external economies of scale (agglomeration economies), notably the localisation economies variant" Bloch and Owusu (2012). Invariably, this linkage development would also enable the support of sustainable commodity production within domestic jurisdictions (Morris *et al*, 2012a). Further linkages from the commodities sector are encouraged because they are not subject to the same price volatilities experienced in commodity extraction. In this way, linkage development would support the expansion of less vulnerable economic structures.

Different types of linkages from the commodities sector have been identified. Initially, Hirschman (1981) classified them into three major types but two more categories were added many years later. These are:

1. Fiscal linkages: The income streams from commodity production and resource rents which governments are able to harvest from the commodities sectors are referred to as 'Fiscal linkages'. These fiscal linkages are derived by the state in the form of export and import taxes, royalties, corporate taxes, and taxation of the incomes of mining company employees and services. These revenues generated have the potential of being "used to promote industrial development in sectors unrelated to commodities" (Morris *et al*, 2012b). Previously, fiscal linkages were the only real local linkages realized in many mineral-rich states that chose this development path. However, it has been found

that in many accounts, fiscal linkages did not yield desired industrialization results. One of the reasons for this is that the resource rents have been squandered through developments in other sectors. Other reasons include the fact that revenue-collection and its storage as sovereign wealth funds might be problematic (Morris *et al,* 2012b). Also, with the instability[63] of revenues from export taxes, this further led to the limitation of resource revenues' contribution to developmental ends. Additionally, imports which provided a very narrow tax base due to their composition meant that import taxes could also not generate the required revenue for developmental purposes (Caldentey, 2008). These, therefore, indicated that the realization of economic growth from fiscal linkages only was not tenable.

Furthermore, the development and utilisation of fiscal linkages in the past appeared to coincide with a commodity-based enclave economy. However, the mining sector is currently no longer being classified as an enclave activity characterised only by fiscal linkages. The improvement of the welfare of the mineral sector from the enclave nature, has led to changes in the nature of its resultant fiscal linkages. Fiscal linkages now have strengthened via the acknowledgement of the mining industry's significant contribution to government revenues over the past decade and with the offshoot of recent commodities price boom. Consequently, in order for fiscal linkages to be effective development mechanisms, it is necessary that the ability to extract revenues must be combined with the ability to invest productively. Examples of such productive investments by governments using mineral revenues are evident in the support of the social amenities, institutions and agencies, which are needed for the sustainability of their societies. In addition, continuous investment and growth produce improvements in the breadth and depth of linkages stemming from the mineral sector (Bloch and Owusu, 2012). Progressively, it has been discovered that the mineral sector is more deeply linked into the economies of many mineral-rich states through a set of as yet under-researched, imperfect, but promising economic linkages (Bloch and Owusu, 2012). These other linkages are hereinafter explored.

2. Consumption linkages: This refers to the incomes (profits from companies and wages from individuals) earned in the commodities sector, which are spent nationally and in

[63] Instability of export revenue was due to dependence on the performance of a very narrow set of exported commodities and on the fluctuations in terms of trade.

the local vicinity on the outputs of domestic industries and other sectors (Morris *et al*, 2012b). They also refer to incomes emanating from processes of import-substitution that are used to purchase goods and services. In many accounts, careful analysis of these linkages shows that the mining sector is connected with the business services sector, utilities sector (energy sector) and the retails sector (Aroca, 2000). Although consumption linkages are difficult to measure, they can be seen to be expanding, as increasing mining activities leads to increasing incomes and flow within mining societies. The effect is that these extra incomes from the mining sector make linkages stronger as new business activities are stimulated. This, thereby, connects more economic sectors with the mining sector. These circular flows support Hirschman's phrase in which he said, "one thing leads to another" (1981).

3. Production linkages: Production by a particular sector has been found to possess two kinds of economic effects on other sectors in the economy; they are backward and forward linkages. According to Miller and Blair (1985), backward linkages are used to indicate the kind of interconnection of a particular sector to those sectors from which it purchases inputs. The backward linkage effect is a measure that is expressed in terms of "the direct and indirect effect on the production of all the industries which provide the intermediate inputs necessary for the production of a particular industry being invested" (Kim *et al*, 2002). On the other hand, Miller and Blair (1985) stated that forward linkages represent the proportion of sector output that serves as inputs to all sectors in the economy. The effect of forward linkages is measured as "the direct and indirect effect on the production of all other industries which use output of a specific industry being invested as intermediate goods" (San Cristobal and Biezmab, 2006). In simple terms, backward linkages refer to the use of inputs produced from other sectors in the economy that are required for production in the commodity sector. Meanwhile, forward linkages refer to the processing of extracted mineral commodities.

According to Hirschman (1981), "direct forward and backward linkages were the most likely to lead to the development of a more diversified economic structure. Backward linkages lead to new investment in input-supplying facilities and forward linkages to investment in output-using facilities". He opined that there exists more opportunities for backward than for forward linkages, particularly in the minerals and energy sectors. He described backward linkages as the 'low hanging fruit', which could easily provide short-term returns to lead commodity firms, their suppliers and customers. Morris *et al* (2012b) concurred with Hirschman's view that production linkages from the resource sector, especially backward linkages, provide important and unrealized potentials for industrial development in many resource producing economies.

Moreover, the idea of using forward and backward inter-industry linkages as measures of economic structural interdependence was first introduced by Rasmussen (1956). The measurement of backward linkages is expressed as the power of dispersion while the measure of forward linkages is expressed as the sensitivity of dispersion. When an industry has both power of dispersion and sensitivity of dispersion values greater than 1 for both backward and forward linkages respectively, this means that such an industry plays an important role in supporting and boosting other industries (San Cristobal and Biezmab, 2006). Invariably, this implies that economic development in the jurisdiction where these linkages exist would be fostered. Comparing the strengths of backward and forward linkages for the sectors of a single economy, provide one mechanism for identifying key sectors (Miller and Blair, 1985). Additionally, carrying out these measurements of linkages for different sectors in different countries not only provides a method of assessing the structure of production within local economies but also a method of making international comparisons thereof (San Cristobal and Biezmab, 2006). With specificity to the resources sector, examples[64] abound of cases where domestic production linkages with their resource sectors have led to remarkable industrial transformations.

Research findings indicate that there is more literature and possibilities available in support of backward linkages than forward linkages. The reasons for weaker opportunities for forward linkages from the resource sector include (but not exhaustive):

i. Limited availability of the highly significant investment required to ensure forward linkages;
ii. The higher production costs of commodities used to produce the sector's output which becomes available as inputs to other sectors;
iii. Weak technologies needed for this stage of production;
iv. Low local/international demand for its outputs;
v. Availability of material substitutes;

64 Examples include Norway, UK, Sweden and Finland's experience where industrialization was realized from their natural resource-based economic diversification, particularly from oil, timber and iron ore. According Blomstr¨om, M. and Kokko, A. (2007), the linkages in Sweden and Finland cases, evolved from the supplies of simply processed products to more advanced products and contributed to the development of a more broad-based economy.

vi. Increased availability of cheaper imports; and
vii. The capital barrier to entry.

On the other hand, the greater opportunities for backward linkages can be better enhanced through the execution of some of the following activities (Aroca, 2000):

i. Development of medium and small supplier programs whose objectives are to improve the quality of the services and inputs that are bought or outsourced by the large-scale mining companies;
ii. Providing support to large-scale mining companies for facilitating the establishment of technical educational institutes. With the existence of low supply of skilled workers at the technical level, initiatives like this could strengthen the productive base;
iii. Hiring of local labour and/or promotion of migration by large-scale mining companies; and
iv. Relocation of the head offices of mining companies to centres of extractive production. This would ensure that many of the firms whose main clients are the mining companies (e.g. financial institutions) to move to the production regions, thereby improving the productive base of the zone through the production linkages arising from the extractive production.

Lateral migration and side-stream linkages are only mentioned and explained briefly because the focus of this research in market (production) linkages, downstream linkages in particular. Lateral migration is a resource-based strategy, which occurs when the generic technologies, knowledge and skills developed in one economic sector (e.g. mining) are transferred for commercial application to other economic sectors (Mintek, n.d.). Side-stream linkages occur when other related and supporting economic sectors provide the mining sector with infrastructural services that are critical for the operation and competitiveness of the minerals industry. These sectors are also beneficiaries of the infrastructural services they provide to the mining sector. Such services include power, logistics, communications, water, financial services, human resource development, and Research and development etc. (African Mining Vision (2009); ISG (2011); Craven (2012). Figure 2.1 gives an illustration of how 'one thing leads to another' from the mineral sector to the rest of the economy.

It must be noted that Hirschman (1981) highlighted the linkage concept as a dynamic rather than a static one, which could "either decay or become enhanced over time". Additionally, it has been highlighted that the linkage effects of a given product line as investment-generating forces are set in motion through input–output relations, when the productive facilities that supply inputs to that line or utilise its outputs are inadequate or non-existent (Bloch and Owusu, 2012).

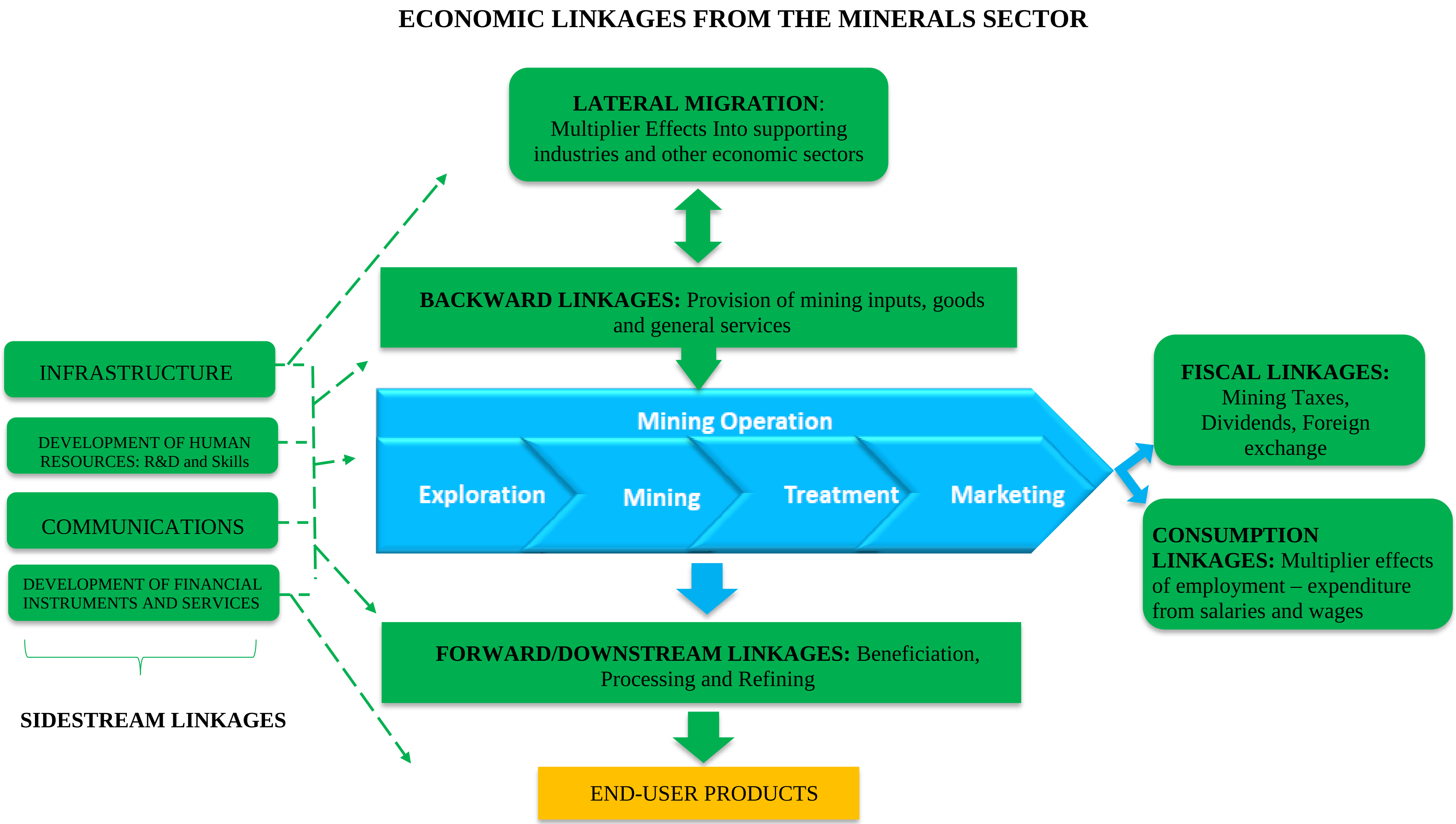

Figure 2.1: Types of economic linkages from the mineral resource development. Adapted from Leeuw (2012b) and MINTEK (2011).

2.5 RESOURCE REVENUES, THEIR USE AND MANAGEMENT.

As indicated earlier on, successful and competitive mineral extraction is one, which can potentially create and sustain substantial value-addition and linkages across multiple industries as well as the national economy at large. However, in order to realize this full potential, an appreciation of the highly capital-intensive nature of this process is important. Mineral extraction firms, whether owned by private enterprise or governments, need capital expenditure (capex) at appropriate levels for ensuring the sustainability of their business case. Stay-in-business capex is needed for the provision of optimal working conditions for employees, and maximization of efficiencies. Also, capex on new ventures is needed for replacing depleted mineral assets and expanding the company's production in general. Added to the capital-intensive nature of mineral extraction is the issue that the industry is subject to the vagaries of cycles, which are mainly in the form of changes in the pricing levels of commodities. This issue implies that input costs such as capex and tax payments, are also subject to cyclicality. That is, where commodity prices rise, the general case over the past decade, is that (capital) costs for running mineral extraction enterprises also increase. The mix of the capital intensive and cyclical nature of mineral extraction has major impact on the enterprises' ability to contribute to the RN goals of their host states. The reality is that it is only when enterprises can produce sustainable growth in *operating* cash flows in the longer run, will they remain most attractive and capable of being socially responsible (Sergeant, 2013).

For situations where the mineral resource sector is mainly under private ownership, it allows for the generation of new interests, as well as the dispersion of proceeds from resource wealth beyond the state apparatus. However, this implies that the state does not benefit directly from the development and export of natural resources as much as private owners, as the state's control over how these resources are distributed and utilized, is reduced. In some countries, this phenomenon inspired governments to be less dependent on their mineral resources and look to generating income from other sources outside the mineral resource sector (Weinthal and Jones Luong, 2002). On the other hand, this phenomenon resulted in some host states being compelled to develop mechanisms for maximal extraction of significant fiscal benefits from private owners, in the name of RN. In these terms, it has been observed over the years that most mineral economies have preferred generating state revenue (fiscal linkages) primarily from the resource sector, instead of direct market linkages (production or consumption linkages) (Nankani, 1985).

In the context of realizing RN, it is apparent that mining firms are not the only parties responsible for this, governments also have a part to play in making sure that the fiscal benefits extracted from the mining firms are used for the benefit of their citizens. Although, literature on the resource curse argue that resource-rich states unhealthily heavily rely on revenue derived from resource sector taxes (see e.g. Karl, 1997), these trend can be deliberately and positively channelled into sustainable use so as to reverse the ‘curse’. Achieving this sustainable end[65] based on the presence of a large mining sector would greatly depend on the willingness and capability of the government to tax mining effectively and to invest productively in priority development areas.

Furthermore, the indirect effect of the reliance of host states on resource revenues is the subjection of the distributional needs of government expenditures, to the fluctuations in mineral export revenues. In this regard, Adams and Behrman (1982) suggested that these fluctuations have tended to be relatively more harmful for labour than capital, and for low-income rather than high-income population groups in many mineral-producing countries. This is due to the cuts in social expenditure which arise during downswings that mainly affect the poor (Mainardi, 1997). Therefore, it is necessary for governments to design their fiscal systems in ways that take into consideration the peculiarities affecting the fiscal flows of the mining business. Following this, it has been argued that in order to alleviate the fixed burden on working costs, taxation should be applied only to profits (Chamber of Mines of South Africa, 1993).

Nonetheless, it has been observed that over the years, there has been windfall opportunities from mineral development that have been mishandled – especially in developing countries. Their commodity export receipts have often not been used fully by governments to increase productive investment. Instead, these receipts appear to have been used to fuel public consumption expenditures, inflation and in some cases, leakages. This consumption patterns appear to have increased the problems around balance of payments and foreign indebtedness

[65] These sustainable ends include:

a. investing in institution-building — most notably, reliable tax administrations and stable tax regimes that provide a broad tax base and ensure popular compliance;
b. investment in the development of other economic sectors e.g. manufacturing, agriculture, human resources;
c. ensuring equitable local distribution of income;
d. provision of public services; and
e. creation of employment opportunities.

in these countries. Such problems tended to worsen in phases of decline in mineral prices, which forced forcing producer countries to increase production (supply) so as to offset the negative trend. Furthermore, at times when positive rent cycles for many minerals have occurred, in spite of frequent negative long-term price trends, this has still served as a disincentive for mineral-producing countries. According to Nankani (1985); Norton (1991); and UNCTAD (1994b), in several developing mineral economies, mineral rent receipts appear to have curtailed the ability for governments' to realize the need to:

a. liberalise their foreign trade regimes (especially because of unexpected downward changes in world demand);
b. adjust their misaligned exchange rates; and
c. avoid or postpone the restructuring of certain sectors. This has allowed, for instance, subsidised domestic manufacturing to continue and food imports to increase, and thus sometimes crowding out their weak and unprotected agricultural sector.

The resultant of the above has been that in the medium term, production inefficiencies increase, as well as the disruption of local investment projects, reduction of the average use of capacity and increased unemployment (Mainardi, 1997). On one hand, this has also resulted in a real exchange rate that most times suit the mining sector (characterised by relatively higher productivity), but on the other hand, rendering to the sector to be overvalued in comparison to other sectors of the economy (Nankani, 1985 and Norton, 1991). With regards to domestic resource allocation in developing mineral economies, it can be deduced that the shortage of human resources and the squandering of mineral rents reinforce each another (Mainardi, 1997). The impoverished human resource capabilities disrupt the efficient and full use of the mineral base, while a high dependency of the economy on mineral rents, especially at low levels of development favour their inadequate allocation (Mainardi, 1997). Acemoglu and Robinson (2012) supported this by saying that developing resource-rich nations fail "because their extractive economic institutions do not create the incentives needed for people to save, invest and innovate". This phenomenon exists based on the nature of consumption, disinvestment and resistance to innovation because of the fuelling of self-seeking interests among (political) elites (Kahn, 2013).

Therefore, for optimal management of resource rents to be realized, an equitable balance in the distribution of rents between governments, resource-extracting firms and local communities, must be reached. Also, the inter-temporal consumption of rents needs to be addressed.

Additionally, addressing the issue of managing resource rents in the face of volatility of commodity prices (which remains despite rising trend prices) and how its exchange-rate appreciation impacts on other traded goods sectors (Morris *et al*, 2012a), could achieved using the macroeconomic models pursued by most of the oil-rich Middle-Eastern nations. Their model involves the ownership of substantial sovereign wealth funds, which are government-sponsored investment vehicles, produced principally from substantial cash surpluses from state investment in the oil boom and/or mineral resources sector profits (Sergeant, 2013). As a rule, these nations use their sovereign funds as passive investments in worthy industries and economic sectors in other countries. These investing nations prefer to play the roles of sleeping partners, so as to avoid conflicts, whether real or perceived. The ultimate goal of governments' owning Sovereign wealth funds is to increase the wealth of their nation, rather than for scoring of any kind of political points. The use of this sovereign fund model is seen to have grown over recent decades.

As this research study continues, the optimal collection and management of resource revenues through mechanisms like dynamic royalties and SWFs would be discussed in more detail. This would be done in the context of the estimated rents that could be captured (in various price cycles) by the proposed 'modified' royalty tax regime (South Africa's regime being the case study), whilst taking into consideration of the peculiar nature of mining business in developing countries in general.

2.6 CONCLUSION

In this chapter, a more lucid meaning of the concept called 'Resource nationalism', based on various imprecise definitions was given. The evolution of the concept was traced down from the time of its manifestation in the post-colonial era till date. Additionally, its different modes of expression over time were highlighted. Based on these, the connection between the RN concept and the drive for the realization of increased economic development from the platform of mineral endowments was also highlighted. It was deduced that in order for economic development under the auspices of RN to be achieved, fostering of economic linkages and the adequate management of resource revenues, is imminent.

The next chapter will narrow down the study to highlighting the expression of RN in mineral-rich states of Sub-Saharan Africa, with further specification on what obtains in SA. The case for fostering linkages especially forward linkages, due to the ‘terms of trade’ argument would also be looked into. The aim of this would be to validate how the argument facilitates the drive for mineral-rich SSA countries to embark on local mineral value-addition, as one of the ‘compulsory’ routes for these countries to take in order to realize industrialization in their jurisdictions.

CHAPTER THREE

EXPRESSION OF RESOURCE NATIONALISM IN MINERAL-RICH SUB-SAHARAN AFRICA STATES: THE DRIVE TO EMBARK ON LOCAL MINERAL VALUE-ADDITION.

3.1 INTRODUCTION

In the previous chapter, the concept of Resource nationalism, its evolution from the post-colonial era to date, as well as its different modes of expression over time, were discussed. In that chapter, it was highlighted that on auspices of the RN concept, the fostering of economic linkages and the adequate management of resource revenues was imminent in order for economic development from the platform of mineral endowments to be achieved.

In this chapter, the expression of RN in mineral-rich states of Sub-Saharan Africa would be briefly discussed. Based on the 'terms of trade' argument, the case for fostering economic linkages as one of the 'compulsory' routes to be taken in order to achieve industrialization of mineral-rich SSA States, would also be looked into.

3.2 THE TERMS OF TRADE ARGUMENT

The combination of the occurrence of the post-2002 commodity price boom, the generation of resource rents thereof and the intense competition in traded manufactures, has led to changes in the trajectory of the commodities-manufactures terms of trade (Farooki and Kaplinsky, 2012). This has created major policy implications for development strategies in resource exporting economies (Morris *et al*, 2012a). Hitherto, many of these resource-exporting countries are currently contemplating and/or working towards diversifying their mineral resource dependent economic structures to industrialized ones. However, many argue whether these economic structural changes should be based on the ideology that manufacturing has higher terms of trade than that of raw commodities. This section aims at assessing the validity of this ideology, so as to establish whether the ideology is a strong basis for resource exporting countries to diversify or stay with their inherent/idiosyncratic mineral resource competencies.

The 'terms of trade' debate was instigated by Prebisch and Singer and it has spanned all through the second half of the 20th century to date. The debate purported that over time, the terms of trade of primary product producing countries, as expressed by changes in the prices of their exports, have been declining relative to the prices of their imports – manufactured and other goods (Tilton, 2013). In their debate, they argued that whilst the markets for primary products were competitive, the markets for manufactured goods were not as competitive. In light of this, they stated that for primary products, the benefits of new cost-reducing technology used in their production were passed on to consumers fully and quickly in the form of lower prices. Meanwhile, in the case of manufactured products, new technology passes benefits to the producers. They further stated that the rise in income levels is more favourable to increasing the demand for manufactured products than the long-run demand for primary products. This therefore implies that the demand for manufactured products and their prices invariably increase more rapidly than that of primary products, as income levels grow over time.

Additionally, their hypothesis rejected the idea that the long-term decline in the prices of commodities in comparison to the prices of manufactures was as a result of decline in their production costs as compared to those for manufactured goods. Instead, they attributed this decline in terms of trade for primary products to the presence of low levels of technological change in primary product producing countries. Their hypothesis further argued that market power produces an asymmetry in the distributions of the benefits of technological progress favouring the producers of manufactured goods (Singer, 1950). As a result of decline in benefits due to deteriorating trade terms, they pushed that it would be better if these countries diversify their economy from depending mainly on the production of primary products and pursue development paths that are based on the establishment and advancement of manufacturing industries (Kaplan, 2012).

In order to validate the Prebisch-Singer hypothesis, extensive empirical studies have been carried out to test whether or not the terms of trade of primary products have reduced indeed. Many of the few notable ones are sufficient to demonstrate the different views. According to Tilton (2013), some of these more all-inclusive studies can be found in Spraos (1980), Diakosavvas and Scandizzo (1991), Hadass and Williamson (2002) and Cuddington *et al*, (2007). In testing the terms of trade debate, Hadass and Williamson (2002) noted that the debate encompasses three questions, which are:

1. "Have the terms of trade of primary products in fact declined over the long run?

2. What are the important determinants behind the observed changes in terms of trade?
3. What are the implications for public policy, especially for developing countries that depend on primary commodity exports?" (Tilton, 2013).

In order to answer these questions, it is imperative to examine the determinants of prices of products which inform their terms of trade, under both competitive and non-competitive markets conditions. A good way to start this is by assessing the price-cost relationship.

According to microeconomics, in competitive and non-competitive markets, prices of products and their costs of production shift together over both the short and long run. Typically, the behaviour of prices and costs are largely as a result of changes in the demand and supply patterns of products. However, it must be noted that there are other factors which are idiosyncratic with the type of product being assessed, that can also affect price and costs.

In the short run[66], the behaviour of the supply curve for a competitive industry is expected to also follow that of its short-run marginal cost curve closely. This implies that as output increases, it is expected that the supply curve should rise. In light of this, when the economy is in a state of boom and demand is strong, in the short run, the changes in demand largely or entirely drive prices. With cause and effect running mainly from changes in demand to prices, this in turn affects production costs and eventually, supply. For instance, when prices rise, companies will hire new and less experienced workers in order to expand their output for the satisfaction of increased demand. At this point, employers will be more interested in maximizing output than in being conservative on costs. This inadvertently causes costs to rise and the supply curve to shift upward, until it gets to full capacity. When full capacity is reached, there will be constrained supply until additional capacity is taken on. This will further cause prices to go even higher (whether demand is high or not) over the very short run, thereby enabling super profits or rents to be enjoyed by producers. These rents continue until (depending on the product in question), the high prices make demand to drop, as substitutes are sought out and used as replacements. Figure 3.1 illustrates the behaviour of prices in relation to shifts in the demand and supply patterns of products, on the short run.

[66] Short run is the timeframe that is not sufficient to add significant new capacity.

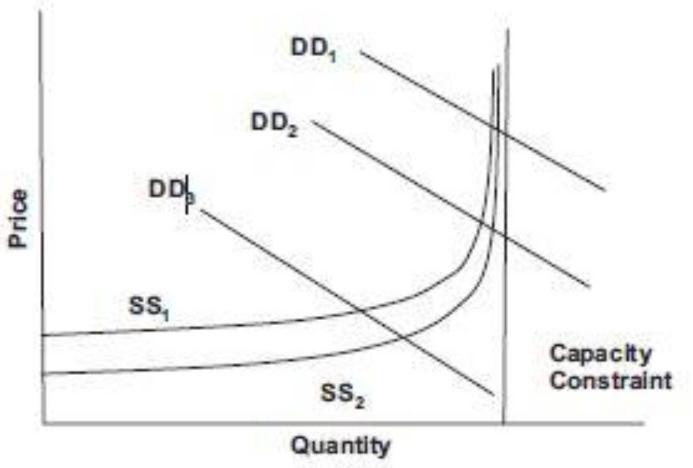

Figure 3.1: Behaviour of short-run prices in relation to shifts in the demand and supply patterns of products. Source: Tilton (2013).

Where,
DD_{1-3} = Changes in demand pattern
SS_{1-2} = Changes in supply pattern

When the economy is in a state of depression and demand is weak, in the short run, prices and costs also shift together. With excess output being produced before demand dropped, the producers would have to reduce prices in order to sell these off. The costs of producing the excess output remain the same until sell-off takes place, thereby allowing for demand and supply to reach a state of equilibrium. At equilibrium, for producers to stay in business and make profits, the weak demand and low prices create strong incentives for them to reduce costs of production. However, cause and effect may run in either direction in this situation[67]. If production costs are successfully reduced and supply shifts downwards, this will also cause price to change, making it decline even more.

On the other hand, in the long run, price trends for most products are driven largely or entirely by shifts in their supply curves (See Figure 3.2). This reflects changes in production costs arising from new technology and other factors. In this instance, the supply curve for most primary products "rises with output but at a declining rate due to the greater availability of marginal resources" (Tilton, 2013). Economies of scale for this case make the (unit) costs of production to reduce. Whereas, in the case of producing manufactured goods, the effect of new technology results in increases in output being made possible with little or no effect on unit

67 The supply curve may shift upward or downward as a result of the success or not of reducing production costs.

costs. This is so because for manufactured products, the quality of resources being extracted is not a major deterrent to its production, instead the availability of inputs if constrained in some other way can be a deterrent factor[68].

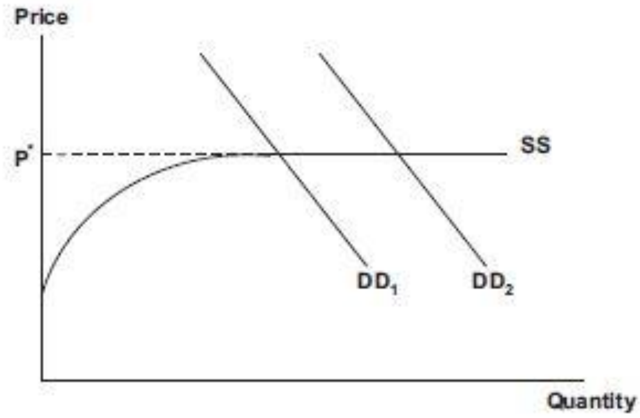

Figure 3.2: Behaviour of long-run prices in relation to shifts in the demand and supply patterns of products. Source: Tilton (2013).

Where,
DD_{1-2} = Changes in demand pattern
SS = Supply pattern

For non-competitive market scenarios where companies have monopoly market powers, in the short run, they possess the ability to control supply. The effect of this is that they are also able to maintain prices above the competitive equilibrium. In the same way, over the long run, their market power enables them to use reduced production costs made possible by advancement in technology to keep prices from dropping. In essence, they hold on to the benefits resulting from new technology, whereas in competitive markets, these benefits would have been passed on to consumers. From empirical studies regarding the relationship between prices and production costs, it has been found that price data are often more readily available than cost data. This is due to the fact that most producers regard their costs as their exclusive property, so they do not make them readily available in the public domain. At instances where cost data are available, many other constraints associated with its unambiguous definition are found. Based on these constraints, findings from some available data show that the terms of trade of primary products

68 An example of this argument lies in automobile manufacturing; if these manufacturers are given sufficient time to increase their own capacity and to persuade their suppliers to do the same, they could double their output without this action significantly increasing the cost per vehicle (Tilton, 2013).

have dropped over the past century. With available cost data only being adequate enough to evaluate the short-run relationship between prices and cost, while cost data spanning over half a century or more that are needed to estimate the long-run relationship being unavailable, it is also not certain whether discontinuities and changes in the long-run trend have occurred. Even if changes have occurred over the long term, available data makes it unclear "whether a downward trend has prevailed in the recent past and continues to prevail today" (Tilton, 2013).

Subsequently, empirical evidence[69] indicate that the relationship between price and cost components are often industry-specific or even country or company-specific and peculiar to different products. Therefore, it is difficult to capture the extent of the trends in the terms of trade of individual primary products or subgroups of primary products by the trend for primary products as a whole. For these different reasons, it is safe to assume that the production costs of most normal primary products change as their prices drop.

These microeconomic facts generally do not clearly show that changing price relationships solely represent associated changes in the real costs of manufactured exports of the industrialized countries compared to the costs of primary products of the less-industrialized countries. Therefore, it is not clearly evident that the terms of trade for primary products have declined in relation to manufactured products. Nonetheless, the facts support some of the Prebisch-Singer hypothesis. For instance, the facts support the notion that the benefits of new cost-reducing technology used producing primary products is passed on to consumers, whilst that of manufactured products is passed on to the producers. With reference to Singer's (1950) rejection of costs being the determinant of declining terms of trade for primary products in comparison to manufactured products, the above discussion supports this. However, with reference to their attribution of the decline in terms of trade for primary products to being as a result of the presence of low levels of technological change in primary product producing countries, validating this requires assessing the productivity effect on products (marketing).

Almost all documented empirical studies seem to show that productivity has increased more and faster in the manufacturing industries of the industrialized countries than in the production of primary (raw) materials, even in the industrialized countries, but more specifically in the

[69] Evidence, especially for primary products, has been seen to indicate that the two components do shift up and down together. Even in the long term, "the real prices of most goods and services largely reflect shifts in their market supply curves and in turn production costs" (Tilton, 2013).

less-industrialized countries (*idem*). Equally, other studies on productivity effect in addition to those assessing the relationship between costs and prices, indicate that when prices increase both labour productivity and total factor productivity tend to drop, which invariably pushes costs higher. Conversely, when prices fall, productivity rises and costs fall. In the face of this second argument (studies), if the claim that productivity of manufactured goods is higher than primary products and the claim that the prices (from more demand) for manufactured products are still greater than primary products are true, what then facilitates greater productivity in manufacturing? The answer[70] would lie in more advanced technical/technological progress in manufacturing than primary production. In this case, manufactured commodities produced in more developed countries would be better favoured than the case of food and raw material production in the underdeveloped countries. However, seeing that price-cost data for both primary and manufactured products do not clearly show a decline in terms relative to the other, it may be safe to say that using changes in productivity[71] as a governing factor to express changing terms of trade cannot be dismissed.

Another important determinant of the changes in terms of trade to consider is the extent to which quality improvements have influenced the prices for primary products and manufactured goods over time. This point was raised by Svedberg and Tilton (2006) because a lot of the available literature on the terms of trade for primary products has yet to address this concern. They observed that over time, macroeconomists seem to have overestimated inflation when converting real prices to nominal prices. This they attributed to the failure of macroeconomists to properly adjust for improvements in the quality of products[72]. The quality of primary products sold on international markets has also improved over time, but it appears that such improvements have not been significant as the quality improvements of manufactured goods. In light of this, it is possible that some of the trend in the terms of trade of primary products simply reveals the fact that the quality of the manufactured goods produced from primary products is rising faster than the quality of primary products (*idem*).

Although Prebisch-Singer's debate over the long-run trend of the terms of trade of primary products has not been resolved, it is necessary to consider the public policy implications that a

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[70] This then supports the explanation that the benefits of technological advancement are distributed to producers (in the form of rising incomes) or to consumers (in the form of reduced prices).

[71] These productivity effects appear to be applicable for most types of goods, whether primary or manufactured (Tilton, 2013).

[72] For instance, "a cell phone purchased today may be 10% cheaper, smaller and better than a similar model purchased a year ago. Thus if quality is held constant, the true decline in price is greater than 10%" (Tilton, 2013).

declining terms would have on countries that produce and export these products. With respect to the policy implications, the Prebisch-Singer hypothesis has been seen to provide much support for the interventionist policies, practised by many developing countries during the 1950s, 1960s, and 1970s. These developmental State policies heralded the promotion of domestic manufacturing and import-substitution to realize economic diversification in their States. The results were generally diverse. Therefore, even if Prebisch and Singer are right to suggest that these countries should move away from producing and exporting mineral commodities and other primary products because their terms of trade are declining, this may just be poor policy advice. The reason for this position is that although it is true that declining terms of trade apparently implies that countries exporting primary products have to offer a bigger basket of export products over time in exchange for a given basket of (non-primary) imported goods, there could be risk in encouraging these countries to abandon their promising inherent source of wealth needed to foster economic development. The risk arises if "the fact that the effect of prices of most goods being correlated with their production costs" is not considered (*idem).*

As discussed previously that product prices generally reflect changes in their production costs, for any particular country, the net effect of falling prices and costs may be positive, neutral, or negative. Either of these results depends on the extent to which both the downward movement of costs and supply curve is sufficient enough to offset the reduced total revenues that accrue from the fall in price. From this, it is conceivable that falling costs can offset the adverse effects of lower prices and declining terms of trade for primary product producers. Thus, if the prices of primary products are dropping but the country's costs of production are dropping more than the market price, the wealth generated from producer surplus (rents) that the country realizes would rise in return. This thereby increases the benefits it would reap from its production and trade of primary goods. On the other hand, even "if prices are rising but the country's costs are rising more, the benefits from production and trade would fall despite the rising price because positive price trends do not automatically translate into above-trend margins" (Tilton, 2013). These possibilities have long been ignored or contended by much of the available related literature.

With this, it appears that the reason why countries producing primary products lose comparative advantage is not because of the decline in prices and the resulting deterioration in the country's terms of trade, but rather because of their failure to keep up with its competitors in terms of reducing their production costs. According to Tilton (2013), the only time the policy advice for moving out of the production of primary products should be given to a country is if the country cannot find ways of cutting its production costs and because of the declining terms of trade. From mineral policy perspective, it is therefore necessary that when governments view diversification from the extraction of their mineral resources for the pursuit of various beneficiation/manufacturing agendas, they must consider that each minerals sub-sector can be regarded as peculiar. The different sub-sectors possess varying and unpredictable supply and demand dynamics, and are also subject to varying outcomes stemming from exogenous input-cost price increases (Sergeant, 2013). If the country's production costs for any of its minerals are falling more than its price, diversifying from this source of wealth might yield unfavourable results for that country.

Furthermore, it must be mentioned that when export prices are escalating, this is not necessarily good for producing countries, since escalating prices normally go along with higher production costs. This would then lead to decrease of the producer surplus realized by countries producing such goods, over time. The avoidance of this scenario depends on how rapidly these countries can reduce their costs in comparison to their competitors, and relative to rising market price. Finally, it must also be considered that if such diversification strategy is adopted by all countries, this would be self-defeating. This is because with countries reducing their output of primary products, thereby moving their labour and other resources into the production of manufactured goods and services, the prices of the primary products would rise while those of the manufactured goods would drop. This will result in a reversal of any declining trend in the terms of trade of primary products (Tilton, 2013). The recommendation to such countries would be the development of industries that can produce manufactured goods that are characterized by rising prices (beneficiation industries,) but should not neglect primary production altogether. These countries can invest in educating more people to be able to work in both sectors.

3.3 LINKAGE DEVELOPMENT FROM MINERAL SECTOR WITHIN SSA MINERAL-RICH ECONOMIES

It is a commonplace phenomenon within many sub-Saharan African mineral-rich economies[73] to acquire more than half of their export revenues from one or two major mineral and petroleum resources. These mineral economies have "tended to keep their export concentration in minerals unchanged as long as sufficient reserves are available relative to their level of capital stock" (Mainardi, 1997). Nonetheless, with respect to the 'declining terms of trade' argument, observation indicates that some of these economies appear to be making some effort at diversifying their exports towards later stages of mineral exploitation. However, with regards to the amount of time that the mining sector has been a major sector in these economies, these diversification efforts do not appear to be so significant (Nankani, 1985).

Additional observation reveals that beyond the geological characteristics of minerals available in SSA mineral-rich states, domestic policies are great influences on the structure and ability of their mining industry to facilitate economic diversification within their States. It has therefore become highly important to examine the policy responses of governments in these mineral-rich SSA countries to changes in the behaviour of mineral commodities and the linkages between the mining sector and other sectors of the economy (Mainardi, 1997). As regards linkage development from the mineral sector in SSA, there are significant prospects for such growth opportunities currently and in the future. For instance, China's increasing role of being both a supplier of mining equipment and an emerging commodity producer in SSA sets the stage for linkage development in the future.

Conversely, there are a number of constraints to the realization of linkage development in many SSA countries, at the same time. This is so because these countries are becoming less advantageous sites for both production and for innovation due to the fact that many of their current government policies do not address these constraints and the mining sector hardly features in their governments' visions for industrial or technology development (Morris *et al*, 2012a). In order for industrialization from resources-base to be achieved in SSA, it is of critical necessity to address the factors, which are currently limiting the expansion and deepening of linkages. Some of these constraints common in SSA mineral-rich states are namely: weak local

[73] Examples of some of these SSA mineral-rich economies that acquire a significant amount of export revenues from a limited base of minerals and petroleum products can be found in Table 1a in Appendix Ia.

content strategies, low availability of local skills, weak industrial base, and the weak/low integration of industrial and mineral sector policies (Teka, 2012). In agreement with the article by Corkin (2012), this study also takes the position that the development of local linkage is one of the most certain ways that SSA countries can benefit and realize industrialization from their substantial and rich mineral resources, as well as address real or apparent concerns of declining terms of trade.

In many developing countries especially those in SSA, linkage development were somewhat stifled with the increase of the globalisation drive after the 1970s. At this time, the intensified competition amongst firms due to their exposure to a larger pool of competitors, made these firms to deliberately focus more on their core competences. Also, with the placement of barriers to entry on goods in that era, this further informed the concentration of firms on producing goods which fall within the sphere of their distinctive competences and are valuable in the marketplace (Hamel and Prahalad, 1994). This led to a situation whereby non-core activities had to be increasingly outsourced to low cost suppliers, while firms and economies specialised in their core capabilities rather than on wholly manufactured products (Kaplinsky and Morris, 2001; Gereffi *et al*, 2005). The mineral sector was not left out of this trend, as mining firms (and countries) concentrated on their extractive competencies and moved away from using their resource-based capabilities to facilitate almost every stage of their mining process. They resorted towards outsourcing to independent firms and industrialized countries for the provision of capital goods and intermediate inputs such as chemicals etc. (Urzua, 2007). With the curtailment of potentially high level of vertical integration of the mineral sector with other economic sectors, this led to the discouragement of linkage development in these jurisdictions (Morris *et al*, 2012b).

With global value chains dominating most manufacturing and service sectors, the renewed RN drive to address the lack of sufficient linkages from the mineral sector now seeks to ensure that mining firms (especially MNCs) begin to look at facilitating the development of local linkages. This is being tentatively rectified through increasing government takeover of the ownership and control of the mining industry along with the direct or indirect contribution of mining firms, either through local value-addition to their core products, local employment or by outsourcing their non-core competencies within local boundaries etc. (Morris *et al*, 2011). However, irrespective of rigid labour laws currently being imposed by governments, these MNCs seem reluctant to develop local linkages in SSA, as they view this activity as being too risky. In all fairness, there are a number of more objective reasons for their position[74]. Such critical problems which serve to inhibit linkage development in regions like SSA need to be addressed urgently. By dealing with these constraints, it can be noted that the current lack of adequate value-addition in SSA will change over time. This position is supported especially by the example shown by Chinese companies with a longer presence in other African markets, which keep showing "increasing adeptness at developing deeper local linkages" (Corkin, 2012).

3.3.1 Determinant factors of linkage development in SSA

In a bid to 'make the most of their commodities', there appears to be a significant knowledge gap[75] with respect to knowing the extent and determinants of linkages in most low- and middle-income economies. This is an unfortunate situation because of the fact that Africa is emerging as the prime jurisdiction for expanding resource production, coupled with its acute dependence on resource exports as well as the underdevelopment of the continent's industrial and knowledge-intensive service sectors. However, many studies[76] from researchers from SSA countries have started to address these concerns and define the requisites to close this critical knowledge gap. The expectation is that these studies will assist policy makers to have clearer direction as to how to 'make the most of commodities', as well as allow analysts to determine what factors impact on the capacity of governments, producers and civil society in this regard (Morris *et al*, 2012a).

The findings from these case studies indicate that some major factors stand out as critical determinants of the advancement of the nature and extent of domestic linkage in SSA context. The development of these local linkages is dependent on the combination of factors peculiar to the sector, the character of global competition and the contextual factors characteristic of the particular environment in which resource extraction occurs (Morris *et al*, 2012b). It has been

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[74] For instance, in terms of linkage development through the use of local skills, multinationals are unwilling to hire local labour due to the prevalent lack of high-level skills amongst locals and when such skills are found, they are more expensive than their international counterparts and would rather bring in expatriates. Also, they do not like to deal with labour unions either because these are considered as being weak or considered to be forces that reduce the productive environment.

[75] This significant knowledge gap seems mainly acute in Sub-Sahara Africa (SSA).

[76] In tandem to this, various analysis using mineral-rich SSA countries as case studies have been carried out to facilitate the drive of using of linkage development to ensure that mineral-rich developing countries 'make the most of their commodities'.

noticed in some mineral-rich SSA countries[77] that the breadth of linkages is often inadequate, with the extent of the depth being even lower than the breadth of linkages.
In addition to these intrinsic and contextual factors, it must also be noted that linkage development is dependent on 'time'. It has been found to be a slow process whose concept and effects thereof need time to be adequately grasped (Hirschman, 1981). Apparently, local linkages are more likely to be developed the older and more established the particular local resource sector is. By implication, this time-dependence means that successful economic growth would inevitably result from an incremental (not necessarily slow) unfolding of linkages between related economic activities (Morris *et al*, 2012b). On the other hand, it must be noted that linkage development is not always progressive, nor is it an automatic ticket for growth and industrial expansion. Also, linkage growth does not occur evenly over time. Nevertheless, as it has been identified that it may be an important nutrient for sustainable long-term development, the realization of progressive linkage development can be enhanced (Morris *et al*, 2012b). This can be achieved when governments[78] as well as major commodity firms, their suppliers and processors recognise the existence of substantial opportunities for linkage development and develop strategic focus for it. In those jurisdictions where these opportunities have been acknowledged, a steady increase in linkage development has been found coupled with significant possibilities for deepening this process.

A series of intrinsic sectoral factors that define the direction and speed of linkage development have been identified (Morris *et al*, 2012a). According to Morris *et al* (2012b), the three primary intrinsic factors that affect the direction and pace of linkage development include:

1. the imperatives of lean production (both in resource extraction and in the supply chain) being important determinants of the nature and location of the outsourcing process;
2. the specificity of resource deposits; and
3. the technological intensity of extraction and processing.

In addition to these intrinsic sectoral factors that determine the extent of linkage development in SSA, other factors that are also important to explain the growth of linkages include ownership, infrastructure, capabilities and policy (and legislation and the role of support institutions) (Corkin, 2012).

[77] For instance, in Angola, Botswana and Tanzania, the only effective value-addition that has been observed was the labour content. However, in Angola and Botswana, an increasing depth to these skills was observed (Morris *et al*, 2012b).

[78] Most times, these opportunities are unrecognised by many governments because they assume that major commodity firms seek to operate in enclaves (Morris *et al*, 2012b).

1. Ownership: Certain characteristics of the ownership of mining firms could potentially have implications on their contribution to the development of domestic linkages. As stated in Morris *et al* (2012b), these include:
    a. the origin of ownership and place of incorporation of the lead commodity exploiting firm;
    b. the ownership of their suppliers and customers; and
    c. The particular nationality of foreign ownership.

    Each of these are important drivers of linkages because it has been found that the general hypothesis supports the fact that the nature of ownership of a company would influence the nature of their activities in overseas markets. Thus, locally-owned and incorporated firms tend more to partake in linkage-intensive arrangements than their foreign-owned ones. With respect to the suppliers and customers of these mining firms, the origin of their ownership and level of entrenchment in the local economy, which determine the horizons being covered by the mining firms may affect the firms' willingness to contribute to domestic linkage development. Mining firms that possess greater access to patient capital and higher internal savings rates, as well as receive support and guidance from their governments, have been found to be more likely to get involved in long term and risky resource extraction, as well as have more patience with local linkage development than their other counterparts (Farooki and Kaplinsky, 2012).

    Additionally, the intense pressure on mining firms from Civil Society Organisations to execute Corporate Social Responsibility (CSR) programmes is one major element of the nationality of ownership of these firms that is critical to domestic linkage development. In respect of this, the observation is that firms owned by nationals from developed countries are often forced to introduce supplier development arrangements that would facilitate the spread of benefits of commodity extraction to communities living in immediate proximity to resource extraction. On the other hand, firms owned by nationals from developing/low-income countries such as China and India are not subject to such pressures of this sort. Consequently, they are less likely to promote linkage development as a response to CSR imperatives (Morris *et al*, 2012b).

Based on the influence that the 'ownership' factor can have on the realization of linkages (value-addition) from the mineral sector, the most preferred regime[79] for facilitation of linkage development favours national ownership or joint-venturing between national government and firms over localisation of value-added by foreign-owned firms. In circumstances where both objectives – ownership and domestic value added – are synergised, the logic is that wherever possible, the supply of products and service delivery in and from the local mining sector is located at the 'doorstep' of the owners of the lead firms, rather than located abroad, or some distance from their extractive activities. This domestic linkage initiative will ensure the provision of efficient proximate suppliers and beneficiators which possess the capacity for flexible and tailored responses to the needs of the extractive firms, allowance for value chain inventories to be reduced, as well as the removal of uncertainties associated with extended logistics. This renewed desire of finding efficient local suppliers and beneficiators located near to the extractive firms is particularly attractive in SSA[80,81] (Barnes and Kaplinsky, 2000).

Apart from the evident indication that cost and price are critical determinants of whether owners of firms/developers consider it profitable for them to establish sustainable domestic linkages, other considerations linked to the nature of ownership exist. These additional critical determinants of likelihood that firms would facilitate linkage development are: the heterogeneity and quality of final products, the frequency, size and predictability of delivery and the customisation of final output. The need to cater for the specificity of local deposits would facilitate the development of capabilities of local supplier and processing firms working to meet this challenge[82]. The fact that this knowledge is location-specific provides the potential for local supply. Thereafter,

79 Embedded in such regime is the promotion of the engagement of national and joint-venture firms in supplying goods and services to and from the mining sector through the preferential local content policy. The aim of this is to synergise the promotion local ownership with the objective of increasing domestic value-addition (Teka, 2012).

80 This is particularly due to the underdeveloped transport systems and logistics in SSA which could cause goods brought in from outside and those for exportation to be subject to long and unpredictable delays, as well as the risk of contravening mandatory government policies put in place to ensure the deepening of local value-addition.

81 In terms of backward linkages, since the initial reason for global outsourcing was to seek the lowest cost supplier, the promotion of near-sourcing would address the imperatives of cost, quality and delivery. Also, in terms of forward linkages because one of the main unique characteristic of mineral resource extraction is that it is location-specific, promotion of the close proximity of mineral processing activities to mineral extraction, would address the above concerns. These linkage phenomena would achieve the realization of domestic linkages via the promotion of near-sourcing (which serves as a particular sub-set of outsourcing).

82 Successful examples are emerging in which global mining companies are actively in the building and development of the capabilities of local suppliers – Chile (Morris *et al*, 2012b).

applications of this knowledge can be used to develop horizontal linkages[83] as the production of products and services can be adapted to different markets, thereby enabling the supplier and processing firms to penetrate new and different markets at home and abroad.

2. Infrastructure: The availability of both physical and social infrastructure has significant impact on the development of linkages into and out of the commodities sector. The effectiveness of the development of infrastructure is dependent on the reliability, quality of provision and the cost to the user. A set of factors have been identified as being important in determining the role played by infrastructure in linkage development. According to Perkins and Robbins (2011); Teka (2012); Oyejide and Adewuyi (2012), these factors include:
    a. The significant impact of the nature of the commodity on the development of infrastructure.
    b. The nature of the infrastructure[84];
    c. The primary focus of infrastructure on meeting the requirements of the lead commodity-extracting firm in a commodity-exporting developing country[85].

    In situations where infrastructure is being enhanced, this can bolster fiscal linkages by facilitating improved production output and hence revenue to the central State and local government. Improved infrastructure also allows for the broadening and deepening of consumption linkages, as well as supports the physical connectivity that allows backward linkages to function. In recent decades, the success of the mining sector that has been observed is partly attributed to the investments in infrastructure[86] made by government with support from the World Bank, IMF and other international donors in mining areas (Owusu, 2001; Aryeetey *et al*, 2009).

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83 An example of this horizontal linkage is in the washing spirals for utilisation in the Canadian tar sands (Pogue, 2008).

84 For example, "the development of road and rail infrastructure as proposed in the corridor infrastructure development programmes in East and Central Africa have the potential to lower logistics costs for suppliers and processors" (Perkins and Robbins, 2011).

85 This is likely to result in an enclave infrastructural development scenario, "which will hamper the ability of local suppliers or processors to link with and participate effectively in the country's commodities value chains" (Teka, 2012); Oyejide and Adewuyi, 2012).

86 Some examples include the fact that many gold mining areas in SSA have continued to receive investment to develop their infrastructure. For instance, the connective infrastructure in Ghana (Greater Accra), notably road, air, information and telecommunications between the headquarters and service complexes of mining firms and suppliers is of great importance for maintaining and enhancing linkages. However, the road infrastructure within the broad Accra region can be problematic, which results in costs incurred by producers and suppliers" (Bloch and Owusu, 2012).

3. Capabilities: Among mineral-based industries, input supplying and primary metal processing activities are considered to be labour-intensive. Apart from the labour skill need of these activities, advanced technologies are also of critical necessity, but these are often lacking or extremely weak in LDCs (SSA countries) (Mainardi, 1997). Hitherto, in order to deepen the development of local value-added linkages effectively in SSA, it has been found that this is additionally dependent on the significant availability of relevant local labour capabilities as well as basic services (although to a lesser degree). As the breadth of linkages develop further with more products being supplied by local producers and the depth of linkages develop through the increase in local content of products that are supplied locally, this will result in the increased demand for skills as well as product and process development capabilities. This implies that the growth of skills and enhancement of technological capacities of commodity producers as well as firms that supply inputs and those that process mining outputs, are therefore critical for boosting of the breadth and depth of linkage. To this end, one of the areas where there have been many attempts to address the capability gap has been with regard to human resource development (Teka, 2012).

   One of the major attempts at addressing the lack of local skills issues has been to institute policies on increasing local sourcing and the preferential regime of local content. However, the effectiveness of these policies in ensuring the employment of locals rather than expatriate skilled and managerial labour depends crucially on high level education and training (Morris *et al*, 2012b). One of the reasons for the lack of adequately skilled local labour in many SSA States is that their educational sector has been historically an under-invested one[87]. As a result, it is not surprising that one of the biggest barriers to increased local employment in SSA is a lack of skills training. In view of the low level of local skills, the commitment to local employment by firms involved in the local mining industries so as to avoid contravention of local skill policies and regulations, has led them to invest in training (Teka, 2012). Furthermore, with industrial capabilities, especially workforce and management skills needing to be nurtured, a range of business development services, ranging from improving access to

[87] For example, in Angola, although social spending had been approximately 30% of the budget since 2007, revised at 32.4% in the 2010 budget, education was only 6.55% of the total budget, and higher education was 0.80% (Angolan Government, 2010).

finance through industrial extension, better coordination and funding of academic and industrial research activities directed at mining is relevant (Bloch and Owusu, 2012).

Another barrier that has been identified as hampering the availability of necessary capabilities for linkage development in SSA is vested interests[88] and lack of political will. According to Corkin (2012), "it appears that the political will necessary to enforce policies related to local content and skills transfer is not yet adequate in SSA".

4. Policy: 'Making the most of commodities' through building productive and efficient linkages into and out of the sector is faced with the challenge of the absence of relevant and effective policies. As developments in local labour skills and advancement of technological capabilities deepen the potential for linkage development, both the breadth and depth of linkage is also a function of policy. In fact, according to Morris *et al* (2011b), policy in some regard is the single most important factor, at least in relation to linkage development in SSA's resource sector. It has been observed that "without appropriate and effective policies in SSA, the de-industrialising consequences of resource extraction may indeed disadvantage other linked sectors like manufacturing" (Morris *et al*, 2012b).

   There is necessity to distinguish between policies that are directly targeted at the mineral sector itself, and policies, which relate to a wider set of sectors that have important implications for the resource sector, especially with regard to the intrinsic factors of ownership, infrastructure and capabilities discussed previously (Morris *et al*, 2012b). In this regard, according to Morris *et al* (2012b), the governments need to:

   a. "develop a realistic strategy for the resource sector's development in general, and for linkage development in particular;
   b. Ensure that their "strategic vision is accompanied by specific policy instruments (e.g. local content policy and capability building of supplier firms production competences);
   c. Ensure that specified policy instruments move beyond exhortation to include positive and negative incentives and sanctions;

[88] As regards vested interests, it appears that the realization of short-term benefits of alleviating pressures to deliver specific public goods (roads, railroads and other infrastructure) has overridden realizing the long-term benefits of skills training and employment (Corkin, 2012).

d. See to it that these policies align and are mutually reinforcing. For example, there is a widespread tendency for FDI in mining to be accompanied by exemption from import duties on inputs, whereas domestic suppliers are expected to pay duty on their imported inputs (Mjimba, 2011). This trade policy undermines other government policies designed to promote backward linkages; and

e. Possess and develop the capabilities to implement their strategic vision and the accompanying policies, as well as the will and legitimacy to do so".

For policy to achieve its stated goal(s), active policy implementation is of great importance. However, the successful design and implementation of policy is dependent on the employment of an efficient strategy. Such strategy for successful policy design requires that policies which have both direct and indirect impacts on linkage development should be constructed to grasp these win–win opportunities (Morris *et al*., 2012b). The strategy for successful policy implementation requires that stakeholders (- State, private sector and in some cases, with civil society organisations, often operating in adjacent local communities) align their visions and capabilities to take advantage of what is perceived to be a significant case for win–win linkage development[89] (Morris *et al*., 2012b). If this doesn't occur, the result would be that the private sector, for instance, would unlikely be able to implement its vision unless it is able to develop a coherent alignment and cooperative interactions with state policymakers and often also with civil society organisations (Morris *et al*., 2012b). Furthermore, according to Schmitz (2007), a successful industrial policy should prod firms to meet certain criteria set by the government and provide support in order for them to do so, as the strong facilitation of linkages[90] from the mineral sector is progressively being regarded as an integral ingredient of 'the social license to operate' for mining in many mineral-rich SSA countries (Corkin, 2012). It is noted that in most SSA States, policy implementation has not matched policy-making on a general note[91] (as reinforced by Teka's (2011) work).

[89] "Lessons can be learned from Botswana, where an effective policy of linkage development is thoroughly informed by industry-specific knowledge, much of it acquired through the buying-in of foreign based specialised expertise" (Mbayi, 2011).

[90] Linkage development often reflects pressures on firms for Corporate Social Responsibility (CSR) (Bloch and Owusu, 2012).

[91] An example is in the case of the Angolan government which has in theory put in place a robust set of local content laws, but rarely oversees their effective implementation. It is also apparent that in Angola, there is a lack of interaction between many MNCs and local policy formulation. This appears to be because the engagement of these MNCs in Angola renders short-term gains for the politicians in terms of rapid service delivery, but at the expense of potentially far wider reaching developments through the transformative nature of local linkages in the form of local employment creation and local

Based on the insights drawn from some of these core factors that are important for the growth of linkages in mineral-rich developing states (SSA), "it is possible thus to construct a general model of linkage development[92]" in these States (Morris *et al.*, 2012b). This model would encapsulate the development of effective strategies needed to address the growing obstacles to realizing mineral value-addition and export-oriented industrialization, which appears to be imperative in mineral-rich commodity exporting SSA economies.

3.4 EVALUATING THE SUBSTANTIALITY OF USING THE MINERAL SECTOR TO SUPPORT INDUSTRIALIZATION

Based on the discussion in the previous section, it can be deduced that linkage development is a journey. Chairman Mao observed this characteristic of linkage development and said that this "…journey begins with the first step" (Teka, 2012). This 'first step' requires an appreciation of the fundamental importance of minerals in the value chains of all modern economies as well as their full contribution to economic activity (San Cristobal and Biezmab, 2006). Without their availability as inputs, a lot of the output of intermediate and finished goods would be unrealizable. Added to this, the true importance of raw minerals is also indicated by the mining and quarrying industry's shares of employment or value-added (Crowson, 2011). This serious lack of public awareness of the importance of raw materials needs to be addressed, and the available statistics on production, trade and usage should be improved (Crowson, 2011).

The strengthening of the industrial sector from the basis of mineral resources should lie at the heart of the development agenda in States (Morris *et al*, 2012b). For resource-intensive economies, the particular challenge posed by this ideology is the widely believed notion that "the exploitation of commodities is corrosive of industrial development" (Morris *et al*, 2012b). There are some principal reasons[93] offered to explain this negative association between

industrial stimulation. The result is dissipation of Angola's resources and removal of the long-term benefits of such large-scale public infrastructure investments that are expected to accrue to the Angolan people (Corkin, 2012).

[92] This model would take into account both of the localisation of goods and services that were previously imported as well as the growing trend amongst lead commodity firms "towards outsourcing inputs and/or activities which they have no intrinsic interest in maintaining in-house since those do not reflect their core competences" (Morris *et al*, 2012b). The economic linkage model would be strengthened by provisions and utilities from reliable and low-cost suppliers based as close to their operations as possible, industrial, infrastructural, spatial and local economic development policies and support measures. Improved industrial capacities for manufacturing, especially for complementary intermediate goods which can serve as inputs to a range of other productive activities, would also enhance linkage development model (Bloch and Owusu, 2012).

[93] According to Morris *et al* (2012a and b), Bloch and Owusu (2012), and Caldentey (2008), the principal reasons for the negative association between resource extraction and industrialization are:

resource extraction and industrialization. This popular perception that mineral endowments seem to be detrimental to the industrialization of its host economy appears to be because mineral endowments are seen to offer lower potential for long-term economic growth than other economic activities such as manufacturing. The poor economic performance of many mineral-rich countries seems to also support this notion.

From all indications, development economics has blamed this developmental challenge of lower-growth potential on the existence of issues like corruption, existence of weak inefficient institutions, high dependence of countries on mineral exports, the capital-intensive, enclave[94] nature of the mining sector, modestly growing production activities and lack of primary commodities production resulting in many productive and advantageous physical backward and forward intersectoral links to the rest of the economy than manufacturing (Thoborn, 1977; Hopkins and Van der Hoeven, 1983; Hirschman, 1958; Seers, 1959; and Baldwin, 1966). In most of these countries, it has been observed that the developmental challenge of economic diversification has been worsened by the easy and increasing embezzlement[95] of the growing and probable persistence of the rents from their resource extraction (Morris *et al*, 2012a). In light of this, another perspective on mining's adverse contribution to industrialization characterized the enclave condition as one in which the mining sector had more external (foreign) linkages than internal (domestic) linkages (Aryee, 2001).

In contrast to the many accounts that seem to support the enclave thesis and view of negative correlation between commodities and manufacturing (as well as between commodities and growth), many other historical and econometric studies have emerged which oppose the concept. Some of such studies highlighted cases from the experiences of other countries that have dealt with these poor performance issues, indicating that positive synergy between

1. the macroeconomic impacts of resource extraction on relative prices and incentive systems;
2. The governance implications of resource dependence, particularly in the case of rent-rich fixed-point commodities such as oil and diamonds;
3. The often high criticism of the industry and government in many literature accounts on mining in developing countries;
4. The inherent enclave nature of commodity extraction, particularly in hard and energy commodities; and
5. The excessive reliance of developmental efforts on the external sector, which has proved insufficient to provide both the required level of finance and the protection to develop domestic industries.

[94] An enclave economy can be identified as one in which enclave-oriented infrastructure have been developed and "designed to facilitate the export of commodities rather than the reduction of logistics costs for domestic manufacturing" (Morris *et al*, 2012b). This enclave phenomenon has also been found to highlight the regional differences in infrastructural development and social inequality of developing economies (Mainardi, 1997). The enclave concept is also very often assumed or linked as part of Hirschman's (1958) ideology on linkages.

[95] The rentier nature of many developing mineral-rich sates is being fueled by corruption and ineffective governance.

mineral endowments and industrialization is possible. The developmental strategies of such countries[96] indicate that mineral resources do actually form a solid base for sustainable industrialization. In some of these countries, during the latter part of the 19th century and the first few decades of the 20th century, mineral development typically served local or regional communities and industry. High costs of transportation[97] in that era discouraged long-distance transportation of raw-materials, production inputs and outputs. This allowed for mines, producers of input goods and services, and industrial centres (where mineral ores were processed and transformed into finished products), to be located close to each other.

Some of these 'positive correlation' studies further illustrate that in cases where resource dependence is associated with a weak industrial sector, this phenomenon "is more often a result of the underdevelopment of the industrial sector rather than a consequence of the destructive impact of commodities production on industry" (Morris *et al*, 2012b). Therefore, what is interpreted as the weakening or adverse effect of commodities-specialisation on the manufacturing sector is more often than not the existence of commodities-specialisation in an economy with no or little history of industrial development. However, in spite of the negative and self-defeating views that mining is an enclave economy with few linkages into the economy, it is opined that it is necessary to go beyond such views in order for the potentials and benefits of mining industry's positive link[98] with industrialization to be realized (Bloch and Owusu, 2012). In addition, Morris *et al* (2012b) argued that irrespective of the historical relationship between industry and resources, recent years have seen the restructuring of corporate strategy across a variety of sectors, including resource extraction, which aim at enhancing the scope for linkage development.

However, it must be noted that despite the pros of establishing local development strategies from the mineral sector, many empirical studies on the mining sector in developing economies indicate that there are a number of risks associated with an excessive reliance of such development strategies (Mainardi, 1997). These include:

- increased constraints on the development of other sectors of the economy;

[96] Some of these countries which include Sweden, Finland, Norway, U.S, Canada, have shown that with economic linkages from natural resource development, diversification and growth of more advanced industries can be achieved.

[97] Due to relatively high transport costs of that era, the shipping of higher-valued semi-finished or finished products was economically beneficial to producers, as opposed to the shipping of bulky, low-value ores.

[98] This is supported by the discussion by Morris *et al* (2011) in which they stated that "even economies built around extractive industry enclaves can pioneer industrial development via local linkages to mining complexes".

- unstable levels of domestic savings and investment, coupled with high levels of consumption and foreign debt exposure;
- inefficiencies in production and misallocation of factors of production;
- maintenance or worsening of dualistic structures and distributional imbalances in the economy; and
- disincentives to liberalise foreign trade and misalignment in the real exchange rate (Mainardi, 1997).

Innovation for linkage development is not so easy, because if it were easy, "all firms and all economies would be at the production efficiency frontier" (Morris *et al*, 2012a). An example of an 'innovative' initiative for linkage development is the offer of 'pledged investments' in the form of infrastructure and energy financing, from superpowers like China to SSA countries, especially the resource-rich ones over the past decade (Guest Blogger for John Campbell, 2018). These investments[99] initially took the form of a "resources for infrastructure[100]" model but it is currently changing to a special-fund-for-development-financing type of financial engagement in Africa (Sun, 2018). To resource-rich States, such investments can be classified as fiscal cum side-stream linkages, which benefit both the resources sector as well as the rest of their economic sectors, and socio-economic development. However, despite the apparent benefits that such pledged investments could proffer or already proffering to these States, the approach (especially that of China) has been have been viewed as a "new form of imperialism" or 'new colonialism' or "neo-colonialism" (Sanusi, 2018; Sun, 2018; Pham *et al*, 2018).

Hence, the management of such innovation is the critical determinant of its resultant dynamic competitive advantage[101]. As stated by Morris *et al.* (2012a), "there is thus considerable scope for policy interventions at the Corporate and State level and in the dialogue between public and private sectors to promote deeper and more rapid linkage development".

99 "Chinese assistance consists mostly of export credits and loans for infrastructure (often with little or no interest) that are fast, flexible, and largely without conditions" (Pham *et al*, 2018).

100 "China needs Africa's natural resources and export markets to fuel its own growth" (Pham *et al*, 2018).

101 In terms of yielding fruitful linkage development in SSA, this is dependent on "whether African leaders will rise to the occasion or whether they will settle for deals that may deliver short-term gains but at significant long-term costs". This is because "Chinese loans are neither inherently good nor bad - they will be whatever the African nations choose to make of them. Increased competition for African real estate and resources should, in theory, enhance the bargaining power of African governments, which is inarguably a good thing." (Pham *et al*, 2018).

3.5 CONCLUSION

Historically, most of the traditional mining activities in SSA have seen low backward or forward linkages with the other economic sectors as regards the development of these economies, other than the exportation of raw mineral products to generate foreign exchange. So currently, these SSA governments are seeing a number of potential benefits arising from investments in economic linkages, particularly the development of subsidiary industries to promote the manufacturing sector vis-à-vis industrial development (Teka, 2012). At instances where economic linkages exist, a general finding is that these linkages in both the upstream and downstream segments of the mineral and oil and gas industries in SSA are mainly reflected through domestic ownership instead of domestic value-added activities/production (Teka, 2012). Therefore, by seeking to imitate countries that have successfully diversified from their raw mineral sectors such as the Scandinavian countries, U.S., UK etc., many SSA governments are progressively pushing to institute policies that would promote economic diversification, through the extension of backward, forward (and other economic) linkages to and from their mineral and/or oil sectors.

Unlike backward linkages, forward linkages, which arise from the processing and refining of raw mineral products prior to their exportation, as well as activities such as marketing and distribution of value-added mineral products, have received some investments but not up to anticipated high levels. One of the main reasons for this is that "many resource rents have been squandered in linkage development in the past, particularly in high profile forward linkages" (Teka, 2012). Hitherto, the goal now is to facilitate a sharply rising trend for investment into creating forward linkages from mineral products.

Based on the discussions on 'terms of trade' and linkage development in mineral-rich SSA countries, the next chapter would look at using South Africa as a case in point. Some of SA's linkage development policies, especially with respect to facilitating forward linkages – mineral beneficiation, would be discussed.

CHAPTER FOUR

OVERVIEW OF SOUTH AFRICA'S BENEFICIATION POLICIES AND STRATEGIES.

4.1 INTRODUCTION

SA is richly endowed with mineral resources. Significant mineral deposits were discovered during the second half of the 19th century and it changed the development path[102] of South Africa remarkably. Dating back from that point in the 19th century, SA's industrial revolution and economic growth and development has been built mainly from mining. Even to date, despite the decline in the mining sector's contribution to the country's GDP, it remains one of SA's major sectors. The sector attracts foreign investment, as well as essentially contributes to the economic growth of the country and her immediate region (Aroca, 2000). However, this vast resource endowment has continually attracted battles for economic and political control between State, labour and capital, especially after the establishment of the Union of South Africa in 1910. With the rise of the RN concept, the battle between nationalism and capital still persists to this day.

In the 20th century, the 'fruits' of mining contributed in enabling SA to perform key functions[103] of a developmental state. World War II ushered in the Government headed by Jan Smuts, which supported the promotion and deepening of industrialization in SA. In light of this, the establishment of the state-owned Industrial Development Corporation, took place in 1940. The aim of establishing this Corporation was to counterbalance the power of the (foreign) mining houses (Kahn, 2013).

After the Second World War, the commodities boom that ensued fed the rise of the mining house oligopolies, which concerned the government of the day greatly. In response to this, the nationalist government that came after the Smuts government sought to limit[104] such perceived

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102 The economy which had been largely based on agriculture and services to international shipping was re-aligned to serve the rapidly expanding mining sector, especially on the Witwatersrand (Du Plessis, 2013).

103 These functions included the founding of South African Railways and Harbours in 1916, the Electricity Supply Commission of 1923, and Iron and Steel Corporation in 1928 etc. (Kahn, 2013). The Carnegie Commission of 1932 during the Herzog administration also established public works programmes such as the Vaal-Hartz Irrigation Scheme in 1934, for the purpose of addressing white poverty (Kahn, 2013).

104 This was carried out by setting a rigorous codification of apartheid, complete with large-scale forced removals, as well as through the use of instruments like Regulation of Monopolistic Conditions Act 1955, which was amended and extended

excesses. With the measures that they put in place, they instituted some form of RN. The response of the international community, especially those countries from which the foreign mining houses hailed, was to place sanctions on trade with SA and/or divest from SA. In addition to these sanctions, it is noteworthy to state that this era was concurrently plagued with issues like the ending of the gold standard in 1970; the rise of worker militancy and the oil crises of the 1970s; the collapse of the Portuguese empire in 1974; the curtailment of migrant labour from Angola, Mozambique, and Malawi; the 1976 Soweto revolt; and the 1979 Iranian revolution (Kahn, 2013). This led to the State being burdened with the cost of economic failure, thereby forcing it to shift economic direction. Furthermore, in the face of these adverse economic shocks, the surges in the gold price experienced in the 1970s, fuelled excessive optimism that the gold sector would be a rescue agent for the South African economy (South African Reserve Bank, 1990).

In the 1980s, the sanctions and divestment only grew worse due to apathy to the apartheid regime. However, by the 1990s as the apartheid regime ended and democratic government was ushered in, macroeconomic policies were often slacked or were relaxed, for the purpose of attracting lost investment[105]. Going forward, just like the slacked macroeconomic policies of the 1990s did not appear to favour most mineral-rich developing countries when the commodities boom of the 2000s occurred, South Africa was also affected. As a consequence of this and with the resurgence of the RN drive of the 2000s, SA[106] decided to adopt policy frameworks that favoured the government and its citizens. In this vein, according to Mainardi (1997), SA aimed at:

a. pursuing greater involvement of the State in mineral rights ownership;
b. addressing inequality, racial discrimination and other apartheid concerns;
c. greater involvement of the State in the administration and management of the mineral sector;
d. the establishment of a national marketing board (the Minerals Marketing Audit Office similar to the De Beers' Central Selling Organisation for diamonds etc.

in 1979 as the Maintenance and Promotion of Competition Act, and again in 1986 to strengthen the Competition Board so as to counter the forces of the mining houses.

105 Although, the goal of re-attracting FDIs was achieved, the reverse effect was that this contributed indirectly to inflationary pressures.

106 SA emulating the examples of countries such as Botswana and Australia.

The discussions in the next sections of this chapter would deal with the RN drive in SA and the supporting instruments that have been put in place to herald the goal of industrialising SA based on its RN claims.

4.2 RN DRIVE IN SA

In the pursuit of the RN trend as the commodities boom advanced down the line in the 2000s, the mode of expression of RN that was proposed by the Youth League[107] arm of the ruling party – ANC (ANC Youth League), was the promotion of the notion of the nationalisation of mines and other industries (Sergeant, 2013). The ANC Youth League had a clear ideological agenda[108] and indeed insisted on it (2010). Their argument insisted that in those few years of higher commodity prices, the windfall from those prices had been distributed in a way that inequality was not lowered and may have increased (Du Plessis, 2013). However, in its promotion of the Nationalisation[109] notion, the ANC Youth League "focused heavily on a purported optimal outcome for nationalisation, without explaining what means would be used to achieve that end" (Sergeant, 2013). This nationalisation proposition stirred up a serious debate in the country, which caused a major disincentive to investment in SA's mining sector and economy in general.

As a consequence, various intensive research and studies were carried out in order to correctly address and sanitize the debate. One of such studies included the SIMS study by the ANC (2012). With respect to the impact of the debate on the future of the economy, the issues that were assessed included:

i. the desirable role of the state in the South African economy;
ii. the fiscal risks or benefits of nationalisation;
iii. the efficiency of the mining sector in South Africa; and
iv. the attractiveness of South Africa for local and international investors (Du Plessis, 2013).

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107 The ANC Youth League appeared to set itself as the voice of the poor and marginalized by using the precepts of the Freedom Charter as its spearhead and on the backdrop of the high level of income (and wealth) inequality in South Africa (Leibbrandt *et al*, 2010).

108 Their ideological agenda of nationalising the mining sector thrived on the basis that mining companies were perceived to enjoy unfair windfalls from the commodity boom/fertile ground caused by higher commodity prices, as had been the case from the beginning years of the 2000s.

109 According to ANC Youth League (2010), "'NATIONALISATION OF MINES' means the democratic government's ownership and control of Mining activities, including exploration, extraction, production, processing, trading and beneficiation of mineral resources in South Africa".

The findings of the studies that facilitated this debate showed that the pro-nationalisation argument did not appear to fully take into consideration that:

i. SA has many commodities, which individually have peculiar operational and market dynamics.

ii. not all of SA's commodities have been windfall-earners.

iii. as a raw mineral producer, SA is a price-taker with the markets still dictating how prices perform.

iv. SA is no longer among those countries where the mining sector is the main stay of the economy[110].

v. empirical evidence indicates that pro-investor policies have delivered many benefits over many decades (Sergeant, 2013).

vi. "nationalisation has many consequences – it impacts on capital markets and investor confidence and may even benefit the owners of depleted assets" (Kahn, 2013).

vii. In constitutional States like South Africa, there are legal guidelines and complex market value considerations that determine the compensation that the government would have to pay for nationalising the mineral sector (Du Plessis, 2013). Apart from the legal restrictions locally, the international investment treaties signed by the SA government commits it to pay full compensation in the event of expropriation (Keeton and White, 2011). Even in a case whereby expropriation becomes constitutionally endorsed, the reversal of private ownership will be messy, divisive, and costly[111,112] as illustrated by the recent cases of nationalisations in countries like Bolivia, Venezuela and Argentina (Sergeant, 2013).

viii. the nationalisation notion in SA "will impact negatively on the value of publicly-traded shares of mining companies with adverse effects on their net asset value, and negative spill-overs onto the value of linked funds[113], especially pensions" (Kahn, 2013). One of

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110 SA's resources sector does not dominate its economy nor does it cause a massive surplus on the current account, which can create the risks of local inflation or decrease in the competitiveness of the industrial sector via the unintended adverse impact of a nominal appreciation of real exchange rate due to a commodity boom (Dutch Disease) (Du Plessis, 2013). Some empirical evidence for this can be found in Du Plessis' (2013) article (pg. 37).

111 According to the Medium Budget Policy Statement (MTBPS), it was shown that SA had no fiscal resources available through taxes or borrowing to come up with the kind of capital that would be required to buy only SASOL, a single asset, not to talk of paying for mines or investing in them, even if the government got the mines gratis (Trevor Manuel, 2011).

112 Moreover, historical lessons from developing countries that took the nationalisation approach in the 1970s and 1980s indicated that the cost that accrued from the economic failures of that era was that many of those governments were still dealing with the challenges of managing significant national budget deficits.

113 In light of the very expensive social programmes that the South African government would be embarking in the years ahead, coupled with rising national deficits and the pressing issue of a seemingly intractable swelling of the trade deficit, it was apparent that the country simply would not to be able to afford the costs of nationalisation in addition (Sergeant, 2013).

the major reasons is that the basic requirements of financial management imply that the resources available to the government for pursuing its other social goals would be diminished (Du Plessis, 2013).

ix. The competitive nature and conditions under which the South African mining sector is being operated, which drives it to attain considerable efficiency, makes it a poor candidate for public ownership. The reason for this is that the after-effect of nationalisation will be the limitation of the scope for distributive policies on the national budget (Du Plessis, 2013).

These externalities hardly pose a case for nationalising South African mines, as this will cost the government more than it would receive[114] (Du Plessis, 2013). Consequently, the National Planning Minister (Mr. Trevor Manuel) said in a speech on 25 October 2011, that "this country desperately needs investment, more specifically, investment in that which we know we have – and that is our rich mineral endowment. And, if for no other reason than we need investment, we must declare repeatedly that the nationalisation of the mines is a seriously bad idea" (Sergeant, 2013). Hence, the recommendations from the studies suggested that for SA to succeed, it needed to foster an environment that is conducive to business and attractive to international investors (thereby matching up with Trevor Manuel's call for investment) (Sergeant, 2013). In order to realize this and remain more investor-friendly whilst rightfully standing on its RN claims, the State should exercise limited freedom of action by not taking the 'nationalisation' route, but a graduated approach in which the right to exploit mineral assets involves private ownership alongside state participation (Kahn, 2013). The findings from these studies resulted in the fading away of the Nationalisation notion after the ANC's Mangaung conference[115] in December 2012 (Sergeant, 2013).

4.2.1 South Africa, a Developmental State

The State has a role to play in the economic development of its jurisdiction. However, "the issue is how to do so without destroying the golden goose or scaring off new investors" (Kahn, 2013). China is one example of a country that improved its 'developing' status to one of currently being a major emerging economy via the interventionist approach of its

[114] The nationalisation of South African mines appeared to represent a major change in the role of the state in the local economy, as it indicated that wholesale nationalisation would make all to be losers (Du Plessis, 2013; Kahn, 2013).

[115] At the conference, not only was the notion of nationalisation removed, "but the very future, if any, of the ANC Youth League itself was put in balance" (Sergeant, 2013).

government[116]. Following China's example, many African leaders adopted a similar discourse at international fora (Domingos, 2004).

SA has had a history of the State playing a vital role in ensuring economic development, most notably through the institutions of what is termed the 'apartheid developmental state' (Kahn, 2013). In the decades after the discovery of the gold and other minerals, the then government realising the critical importance of mining in terms of both local and international trade and finance, decided to use the resources industry[117] as a major medium to actively get involved in influencing the course of its economic development[118] (Du Plessis, 2013).

When the democratic government took over, it also played developmental state roles. However, in the later years, the ANC[119] toned down its interventionist approach to the economy (Sergeant, 2013). Moreover, in the era of the nationalisation debate, the Commission on Growth and Development[120] recommended that the government should indeed take an active part in the process of economic development, by taking a risk-management approach[121] to policymaking. On this backdrop, the government promised to provide policy certainty going forward as part of its developmental role[122]. However, it indicated that, for instance, "there could be a new tax regime for the mining industry, which may include export taxes on 'strategic minerals', in case miners decline to cooperating with government's developmental aims, particularly with respect to pricing" (Sergeant, 2013).

Tying the findings of the research studies carried out in order to correctly address the nationalisation debate with the 'Developmental State' discussion, neither of these provides support for the initially proposed nationalisation of a large sector, such as mining in South Africa (Du Plessis, 2013)**.**

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[116] Its government was determined to take control of its own destiny by reassessing its tactics, putting more emphasis on its economic development and focussing its foreign policy on the principles of sovereignty, opposition to hegemony and self-reliance, in tandem with calls for a new international economic order.

[117] At the time, "mining attracted massive direct foreign investment, thereby allowing the economy to build capital much faster than it would have been possible from domestic savings alone" (Du Plessis, 2013).

[118] One of the most obvious developmental ways in which the apartheid developmental state used mining's 'fruits' was through the provision of public infrastructure (Kahn, 2013).

[119] By its own admission, one of the reasons for the State's reduced intervention is that it "lacks the technocratic skills to develop new interventions solely based on in-house expertise, which means that wholly private or public-private developments will be catered for" (Kahn, 2013).

[120] Their advice was not sympathetic to achieving this by going the nationalisation route.

[121] This would entail small policy adjustments that would allow for reversals if the results are undesirable (Commission on Growth and Development, 2008, pg. 31).

[122] The developmental role of the State will continue to entail infrastructure provision, scientific and technical services and support for research (through institutes like CSIR, Mintek) in cooperation with the private sector research partners such as Anglo Research, Anglo Platinum, and the Aurum Research Institute etc. (Kahn, 2013).

4.2.2 The case for value addition to minerals in SA

In terms of carrying out developmental state roles by SSA countries, one of the major ways that begs such intervention is for the next phase of development – industrialization – to be realized in Africa[123]. This will be characterised by value-added production as industrial economic activities is generated from the continent's natural resources and energy sectors. In order to facilitate SSA governments in this specialized developmental state role, the Chinese government agreed[124] to give such support. For instance, by providing investment for exploration and the beneficiation of metallurgical resources and that such beneficiation should take place in Africa (Domingos, 2004). Hitherto, Guinea is one of the countries whose government recognized that it can play its developmental role for the purpose of industrialization by working together and alongside with capital and labour[125].

Another SSA case in point is South Africa. With the mineral extraction sector of SA being recognized as one that continues to hold unexploited resources, it has been on the front burner that its mining industry could add greater value to its minerals so that resource-based industrialization can be achieved (Baxter, 2005). For this to occur, the government has been urged to play a developmental role by facilitating this value-addition drive[126] over time. As stated in Naidoo (2012), with value-addition taking place outside SA, this represents opportunity loss in export revenue and employment-creation opportunities. To address this situation, the Minister of Trade and Industry, Dr. Davies reiterated that minerals beneficiation[127] was one important element for creating more jobs and promoting the industrialization vis-à-vis economic development of South Africa and the African continent. In this regard, the questions that really need to be answered are how to define beneficiation, who the lead agents for driving the process should be, and how could beneficiation be encouraged going forward (Baxter, 2005).

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123 In light of this, China agreed that Africa needs to add value to its agricultural, mineral and metallurgical resources, so as to instigate industrialization in this jurisdiction (Domingos, 2004).

124 However, this agreement also came with a clause that this facilitation must be carried out on a reciprocity basis with due consideration to sound environmental practices (Domingos, 2004).

125 For decades, it has followed a joint venture approach to the mining operations of its bauxite mines. Its policy of recent past has promoted investment in alumina refineries, for the purpose of further adding value to bauxite within the country. However, it has been less forceful on insisting on such a role in other sub-sectors, like iron ore, diamonds, and gold (Sergeant, 2013).

126 This call for value-addition within SA, is based on the view that with respect to its previous colonial history and heritage, the country sees most its products being exported as raw materials to the previous colonial powers, where they are 'beneficiated' and then re-imported back into South Africa. As this plays out, all the jobs in the processing side are also exported outside the country (Baxter, 2005).

127 Dr. Davies said that beneficiation will ensure that the country's minerals would be used as a tool of development by adding value to domestic mineral products before they are exported (Medupe, 2013).

According to Baxter (2005), “beneficiation is defined as the process of adding value from mining right through to the final fabrication of a consumer branded product”. In actual fact, beneficiation is not a new concept to SA, instead beneficiation has a long history in the country, which was partly as a result of market dynamics as sanctions on the country increased from the 1950s[128]. On the other hand, beneficiation was also partly a product of extensive government developmental interventions as the South African government sought to leverage the country’s mineral resources to advance upstream and downstream industrialization[129] (Govender, 2012). As at now, beneficiation is still taking place in South Africa, where commercial opportunities for it exist[130]. Currently, with about 30% of SA’s total exports still being minerals-driven, if one adds beneficiated mineral products (– PGM metals as catalytic converters, ferro-alloys, chemicals from coal, stainless steel, etc.) are added, this causes the export earnings of the minerals complex to account for about 50% of total merchandise exports” (Baxter, 2005). Sasol, a SA-based energy company and originally founded as a state-owned enterprise in 1950, provides a useful example of a mining company that also ‘beneficiates’, or ‘adds value’ to an extracted mineral[131] (Sergeant, 2013). The group mines coal, but it is far better known for its production of synthetic liquid fuels.

This ‘recent’ call for value-addition to SA’s minerals has raised the debate, which has focused on why mining companies appear to have ‘caused’ a low amount of beneficiation in the country. One of the main reasons for this is that as one goes through the different processes of minerals beneficiation, many of the mining companies tend to be concentrated on mining only[132], because they possess the skills, competencies and aptitude to tackle issues in that particular area. They move away from the manufacturing beneficiation area, because they opine that this is where the manufacturing sector has the skills and competency to deal with the issues. Based on the specialisation model that exists – the Anglo-Saxon profit maximisation

[128] Beneficiation often started in response to the needs of the mining industry and usually involved the use of by-products resulting from primary processing of mineral resources, which were sometimes re-used as production entrants in the mining process, or as products for final or intermediary consumption” (Govender, 2012).

[129] For instance, the bulk of the country’s electricity being generated from coal power stations, which consume more than 50% of its annual production of coal, is another testimony to the fact that the concept of beneficiation is not new in South Africa (Naidoo, 2012).

[130] In 2008, only 11% of the country’s minerals were processed, yet this small amount added value worth R86 billion. In 2010, total primary mineral sales exports increased by 26.8% to a total of R224.2 billion.

[131] In fiscal year 2011, the company published a ‘value added’ statement, which indicated a wealth creation of about R57.4 billion from its value-addition activities (Sergeant, 2013).

[132] It has been observed that “the majority of mining companies prefer to remain ‘upstream’; except for companies like Alcoa which can be found all along the value chain from mining of bauxite to producing highly specialized fabricated aluminium products (Sergeant, 2013).

model, this separation between skills and competencies is very important as companies find it very difficult to go into areas where they do not have the competence and skills (Baxter, 2005).

Furthermore, this separation that obtains between mining and manufacturing companies with respect to mineral beneficiation activities, also seemingly applies to 'mineral-rich/mining' and beneficiating countries. If one compares where the majority of raw production happens with where the majority of beneficiation/fabrication takes place, the observation is that "the vast majority of beneficiation actually takes place in countries that do not mine the product at all or do not mine much of the product[133]" (Baxter, 2005). What these countries that beneficiate have done is to focus their skill sets on the manufacturing aspect, because raw mineral products can be accessed at roughly the same price anywhere in the world (*idem*). Other issues that are now the crucial drivers and determinants of where fabrication takes place include competitive production, skills, availability of large domestic markets, good market intelligence, knowing what products you need to sell into which markets, having a low cost of doing business, and having low materials funding costs etc. (*idem*).

Against this backdrop, there appears to be a positive case for value-addition to mineral endowments of 'miner' SA. However, this can only successfully yield positive results by addressing the question of beneficiating its raw minerals by focusing of its attention on its manufacturing sector, rather than trying to force mining companies, or trying to place pressure on mining companies to do something about this[134]. With the manufacturing sector not performing to the extent that it possibly could have, there is need for a quantum leap of its productivity levels. Government, labour, and business should be focusing on providing an environment, which allows the manufacturing sector to be competitive[135]. Minerals beneficiation at the manufacturing level is a complex area, but government, Mintek and other role players in this matter can deal with the lot of legacies that the country has been faced with such as a lack of attention on education and skills development.

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133 Apparently, most of the 'miner' countries are not necessarily into fabrication, the fabrication is generally done in many other countries such as India, Italy, Turkey, etc.

134 Two pieces of legislation in SA – the Diamond Amendment Bill and the Precious Metals Amendment Bill appear to have leaned a little more towards pressurising the mining companies to beneficiate.

135 Competitive advantage issues in the manufacturing sector are related to competitive production, craftsmanship and the specific skills that are required for processes like jewellery fabrication, the production of catalytic converters etc. or access to markets (Baxter, 2005).

4.3 MINERAL BENEFICIATION-RELATED POLICY REVIEW IN SA

Historical experience has established that the existence of actual minerals themselves do not really constitute much of an advantage to its host States because these raw minerals can be bought at the same price anywhere in the world. However, this comparative advantage[136] can be converted to having competitive advantage (Baxter, 2005).

Apart from taxes, the availability and production of raw mineral resources, like precious metals and diamonds, in SA appeared to constitute few advantages. However, as mentioned in the previous section and in accordance to a statement by the former Minister of Minerals and Resources, Minister Shabangu, "beneficiation is the vehicle through which South Africa's resource-based comparative advantage can be transformed into a national competitive advantage" (Naidoo, 2012). Furthermore, according to the former minister, with the cry for nationalisation being off the table, the beneficiation policy would go ahead as part of the government's RN plan (*idem*). To achieve this, a number of issues relating to the manufacturing sector need to be looked at, e.g. introduction of export taxes on raw materials in a bid to boost manufacturing in downstream industries and create jobs (*idem*).

Shabangu further reiterated that it was not the government's intention to force or pressurise mining companies to beneficiate, instead to address the challenge of the inaccessibility of SA's raw materials "as an impediment to greater local beneficiation" (Naidoo, 2012). Therefore, government policies can be directed at further developing the manufacturing sector and nudging mining companies to embark on value-addition process as much as possible. These policies should also encourage companies having sophisticated technological competencies, which supply the mining sector as well as those that use the products of the mining sector, to spread those competencies 'laterally'. The potential for mineral beneficiation in South Africa would be strengthened as these policies make the country an enabling climate for attracting:

1. TNCs that can enhance and develop products locally;
2. local firms that are able to develop unique and leading-edge products; and
3. numerous local companies with significant capacity in mining technological equipment and services, which can compete in technologically sophisticated segments of the market and which have a global reach (Kaplan, 2012).

[136] For instance, having good natural beauty in your landscape, natural tourist attractions, having the minerals in the ground and being able to produce them.

Some of the policies, legislation and incentives[137], which the SA government[138] has enacted to show its commitment to the promotion of local mineral beneficiation, have been identified. All of these aim at facilitating the achievement of this national RN imperative, so that growth of industry and the country receiving greater competitive edge is realized. These legal and policy instruments are stated, but not limited to the following:

1. The Reconstruction and Development Programme.
2. White Paper: A Minerals and Mining Policy for South Africa (1998)
3. Mineral and Petroleum Resources Development Act of 2002 and its amendments
4. South African Mining Charter of 2004
5. Diamonds Amendment Acts, 2005 (Act No. 29 of 2005 and Act No. 30 of 2005)
6. Precious Metals Act 2005, Act No.37 of 2005
7. IPAP
8. MPRRA
9. New Growth Path
10. Beneficiation Strategy for the Minerals Industry of SA
11. NDP
12. MVS

As these instruments have largely formed the basis for the call for mineral beneficiation in SA, their provisions in this respect would be briefly expounded.

4.3.1 The Reconstruction and Development Programme (November 1994)

The RDP advocated greater equity as the basis for long-term development and growth (Economic Development Department, 2015). It acknowledged that mining and mineral products contributed significantly[139] to SA's economy but that this could be much higher if the raw materials were further processed into intermediate and finished products before being exported. Therefore, in an attempt to add more value to our natural resources before export, the RDP formed the basis for the concept of mineral beneficiation in SA. It posited that increased

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[137] Some of these incentives included tax reductions, training allowances, the development of transport corridors and special economic zones, as well as incentives for research and development (Erasmus, 2013).

[138] Radebe, founder of Mmakau Mining, said there were a range of government-driven incentives and benefits available to beneficiation companies and to both greenfield and brownfield initiatives.

[139] SA mining sector's contribution to the economy - over three-quarters of South Africa's exports and employed about three-quarters of a million workers.

levels of mineral beneficiation could be achieved through appropriate incentives and disincentives in order to increase employment. It also recommended that a future policy should facilitate the provision of more appropriate inputs for manufacturing in South Africa and increase employment (DMR, 2013).

4.3.2 White Paper: A Minerals and Mining Policy for South Africa (October 1998)

The aim of the White Paper on Minerals and Mining Policy[140] for South Africa was to develop South Africa's mineral wealth to its full potential and to the maximum benefit of the entire population. It was forward-thinking with respect to mineral beneficiation as it stated that government would be involved in the promotion of secondary and tertiary mineral-based industries, for the purpose of adding maximum value to raw materials (DMR, 2013). The main discussion around Government's Beneficiation Policy and strategy was anchored on the Minerals and Mining Policy for South Africa.

4.3.3 Mineral and Petroleum Resources Development Act of 2002 and Amendments.

In support of the concept of mineral beneficiation, which was developed mainly on the basis of government policies like the RDP and Minerals Policy, the MPRDA 2002 was enacted in 2002 (DMR, 2013). Amongst other issues relating to regulating mineral development in SA, the legislative terms for mineral beneficiation were stated in Section 26 of the MPRDA. Its provisions stipulate that:

1. the Minister of Mineral Resources would promote the beneficiation of Minerals in the Republic;
2. If the Minister, acting on advice of the Board and after consultation with the Minister of Trade and Industry, finds that a particular mineral can be beneficiated economically in the Republic, the Minister may promote such beneficiation subject to such terms and conditions as the Minister may determine;
3. Any person who intends to beneficiate any mineral mined in the Republic outside the Republic may only do so after written notice and in consultation with the Minister (Department of Mineral Resources, 2011).

[140] Mining Policy was enacted in October 1998.

By implication, the Minister was empowered to initiate or prescribe beneficiation levels of minerals in SA. These provisions were designed to ensure a commitment from mineral producers to support local beneficiation by availing access to minerals in South Africa readily and at discount prices (Department of Mineral Resources, 2011b). The expected result would be security of supply of input materials to downstream industries for conversion into higher value goods, thereby, increasing job opportunities and export revenue gains through increased economic activities realized by extended mineral value chains. Even though mining companies appeared to commit to supporting SA's beneficiation objectives, the pricing aspect of the MPRDA's provisions did not find favour with them[141]. Therefore, it was critical to propose that the MPRDA adopt competitive pricing mechanisms, which would be supportive of the beneficiation strategy[142] (Department of Mineral Resources, 2011b).

4.3.3.1 MPRDA Amendments

In light of the ANC rejecting outright nationalisation as a policy option, legislators engaged in processing amendments to the MPRDA 2002, with the aim of ensuring that South Africans get much more benefit from the nation's mineral wealth. Although, the Bill had been amended four times since its original version was published for public comment in December 2012, the National Assembly (NA) released the Mineral and Petroleum Resources Development Amendment Bill 2013 on 12th of March 2014[143] (Webber Wentzel, 2014). The Bill amended a number of key provisions of the MPRDA, including inter alia, a new definition for designated minerals.

With respect to the amendment of section 26 of the MPRDA, which refers to beneficiation, the Bill grants the Minister of Mineral Resources extensive discretionary powers to drive the State's beneficiation objectives. The Minister's discretion must be guided by reference to 'national development imperatives'. According to Webber Wentzel (2014), the following are some of the key amendments to Section 26 of MPRDA, whereby the Bill obliges the Minister of Mineral Resources to:

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141 In this vein, Sandile Nogxina, former Director General of DMR, said that "….while mining companies are keen to assist beneficiation by ensuring that raw materials are available, they cannot subsidise those prices below global levels" (Govender, 2012).

142 Furthermore, "the provisions of Section 26 of the MPRDA would need to be aligned with the beneficiation strategy to ensure that there is sufficient feedstock available for downstream beneficiation" (Govender, 2012).

143 This 2013 amendment represented the most significant changes made to the Act since its promulgation in May 2004.

1. "initiate or promote[144] the beneficiation of mineral resources in the Republic";
2. "designate[145] any mineral or mineral product for local beneficiation and to determine the 'terms and conditions applicable to beneficiation of mineral resources as contemplated in Section 26";
3. Also "publish such conditions required to ensure security of supply for local beneficiation in the prescribed manner";
4. "establish an advisory council[146] under Section 56A of the MPRDA".

A critically important pricing issue for the sale of designated minerals for local beneficiation was raised in the draft amendment Bill that was published in 2012 (Minister of Mineral Resources, 2012). Initially, the price at which designated minerals were to be sold was stated as 'prescribed' under the model of 'developmental pricing conditions'. However, this was resolved by the 2013 amendment, through the adoption of the concept of 'mine gate price or agreed price[147]'. In terms of mineral beneficiation and restrictions on export, the Bill specified that any person who intends to export 'designated minerals', must obtain the Minister's written consent prior to doing so (Leon, 2013).

It is noteworthy to state that in response to these changes in the 2013 amendment, the South African Chamber of Mines (CoM) gave significant industry support to government's beneficiation aspirations. On the issue of domestic pricing, the CoM's chief economist said that "the mine gate price is equivalent to export parity pricing[148] and is market-related in contrast to 'developmental pricing' which is not" (NUMSA, 2013). In this vein, Baxter said that "at both a regulatory and policy level, we have been moving in the right direction and the DMR must be given credit" (McKay, 2014). However, the industry was still concerned about the prevailing lack of skills and capacity that would be required to establish competitive minerals value-addition

[144] The 2013 Amendment Bill gave the minister extensive discretionary powers to set the quantities, qualities, percentage per commodity and price that is required for beneficiation, the percentage of raw mineral production to be offered to local beneficiators as well as timelines for beneficiation in regulations.

[145] After the Minister makes a decision to designate any mineral for the purposes of beneficiation, this must be published in the Government Gazette. This implies that Government at short notice would be able to enforce the portion and the price at which strategic minerals produced by private sector have to be sold domestically at below market prices for the purpose of encouraging the local downstream industry. Some of the main targets for strategic designation are iron-ore and coal for steel and power, as well as platinum for autocatalysts" Liberum stated (Kolver, 2014).

[146] The Minister must consider the advice of this council before designating a mineral for beneficiation; the council's recommendations are, however, no longer required as a condition precedent to the exercise of the Minister's powers.

[147] In the amended Section 1 of the MPRDA, 'mine gate price' is defined as "the price (excluding VAT) of the mineral or mineral product at the time that the mineral or mineral product leaves the area of the mine, and excludes charges such as transport and delivery charges from the mine area or the mine processing site to the local beneficiator" (Webber Wentzel, 2014).

[148] Less transport costs, which also takes account of production costs.

facilities (Webber Wentzel, 2014). As there were supportive opinions so also have contrary views to the amendment's provisions been raised, by opposition Members of Parliament (MPs) as well as oil and mining companies. More details over both views are in the Table 1b in the Appendix Ib.

According to a statement by Mines Minister for the Democratic Alliance, James Lorimer to the National Assembly (NA), he said that the 2013 Amendment Bill contained many instances where key rules were to be decided by regulation[149]. He then stated that these and other provisions were opaque and would stop the mining sector growth, probably leading to closed shafts and workers losing their jobs, thus, the State would be put in a worse position than it is already (McKay, 2014). Beyond these, the amendments sought to align the MPRDA with the Beneficiation strategy (Creamer, 2011b).

4.3.4 South African Mining Charter of 2004

In order to facilitate the realisation of the country's beneficiation objective, the Mining Charter offered a regulatory incentive to mining companies that would support mineral beneficiation (Department of Mineral Resources, 2011d). It specifically stipulated that mining companies would be able to offset[150] the value of the beneficiation level achieved by the company against the Mining Charter's requirement for 26% BEE ownership (Department of Mineral Resources, 2011). These beneficiation offsets were marked as a major milestone towards creating an enabling environment for value-addition in SA, as embedded in Section 26 of the MPRDA (*idem*).

4.3.5 Diamonds Amendment Acts, 2005 (Act No. 29 of 2005 and Act No. 30 of 2005)

In the RN drive for mineral beneficiation in SA, The Diamonds Act No.56 of 1986 was amended as Diamonds Amendment Act No. 29 and Act No. 30 of 2005 (Department of Mineral Resources, 2011c). The rationale for these amendments was to: "increase access to rough diamonds for jewellery manufacturing in South Africa; maintain security of supply of rough

[149] Regulation is decided by the Minister of Mineral Resources, which implies that this would allow the minister to rule the sector by making regulations which can easily be changed at short notice (Kolver, 2014b and McKay, 2014).

[150] The beneficiation element makes provision for mining companies to offset up to 11% of their ownership requirements (Department of Mineral Resources, 2011b).

diamonds; promote the beneficiation industry in South Africa thus creating jobs; and increase participation throughout the diamond value chain" (Department of Mineral Resources, 2011).

4.3.6 Precious Metals Act No.37 of 2005 (PMA)

This Act was enacted for the purpose of providing for "the acquisition, possession, smelting, refining, beneficiation, use and disposal of precious metals" (Department of Mineral Resources, 2011). The precious metals refer to gold and the platinum group metals (PGMs), with the exclusion of Silver (Department of Mineral Resources, 2011). Section 12 of the PMA empowers the Minister to only grant permission for the export of unwrought precious metals, after he/she is satisfied with the extent to which the applicant has facilitated access for local beneficiation (Department of Mineral Resources, 2011b). The PMA was designed to ensure that priority be given to "those applicants whose beneficiation processes will be at the last stage of the mineral beneficiation value chain or will have a positive impact on the beneficiators in the last stage of the mineral value chain" (Department of Mineral Resources, 2011b). This provisions of the PMA are much more effective when used in conjunction with Section 26 of the MPRDA's provisions for local beneficiation before export occurs.

4.3.7 Industrial Policy Action Plan (IPAP)

Even though the ratio of beneficiated exports to primary products exports have steadily improved since the 1970s, these ratios are still well below the potential (Department of Mineral Resources, 2011b). In addition, the historical dependence of SA on resource extraction implied that a range of government functions – infrastructure, education and training, industrial financing and regulatory frameworks – have not been adequately geared towards supporting new employment-creating sectors (Economic Development Department, 2015). This combination therefore contributed to the crucial need for an active industrial policy to be in existence in SA (Economic Development Department, 2015). The government's industrial policy recognised that minerals are a vital input to an industrialization programme, which is intended to accelerate manufacturing in South Africa for local consumption and export. It therefore called for a paradigm shift in mineral development, which would increase strategic investment in assets that would maximise long-term growth, increase beneficiation projects, enhance value of exports, increase sources for consumption of local content, as well as create opportunities for sustainable jobs (Department of Mineral Resources, 2011b).

For the implementation of industrial policy, the Industrial Policy Action Plan (IPAP)[151] was developed. It set out specific and detailed key actions and timeframes needed to spur industrial growth and reduce unemployment, in its IPAP horizon, which covered a three-year period[152]. In order to facilitate the development of these strategic action plan and timeframes designed to advance backward and forward beneficiation across five resource sub-sectors, a study[153] was undertaken.

According to the Trade and Industry Minister – Minister Davies, the latest version of the action plan aimed at promoting long-term industrialization and diversification beyond traditional commodities and non-tradable services, by focusing on expanding value-added production sectors with high labour-intensive employment and higher growth opportunities, led by manufacturing (IDC, 2014 and City Press, 2013). The IPAP had three main components:

- "A range of sectoral actions;
- A set of cross-cutting actions of particular importance for industrial policy; and
- Measures to improve government's organisation and capacity to implement industrial policy" (IDC, 2014).

Mr. Zalk, the Deputy Director General, Industrial Development Division of the DTI reiterated that these IPAP2 components needed to be comprehensive and integrated. He presented the potential industrial sectors in three groups: new areas of focus, scale-up of existing IPAP sectors, and sectors that would develop long-term advanced capabilities (Gamede, 2011). In terms of new areas of focus, Dr. Davies explained that with State's support being centred on nurturing industrial development, the IPAP focused on mineral beneficiation, regional integration, providing incentives to promote innovation and technology, as well as infrastructure development (City Press, 2013).

In light of South Africa benefitting from the depth and capacity of its private sector, which have enabled innovative and strong responses to new challenges, Zalk also spoke about IPAP leveraging on private sector investment (Economic Development Department, 2015). In the

[151] It was originally launched in 2007 but its fifth iteration was launched in 2013.
[152] From April 1, 2013 through to March 31, 2016.
[153] The study was undertaken by the IDC, with guidance from the DTI, the NT, the DMR and the DST and covered these sub-sectors: ferrous minerals and metals, platinum-group metals, titanium and pigments, polymers, and mining inputs (Creamer, 2013).

Mining Indaba Investment Promotion workshop[154], the Chief Director of Investment Promotion at the DTI, Yunus Hoosen, encouraged investors and South African mining representatives to beneficiate more of the country's mineral resources in order to create jobs and drive enhanced revenue creation[155]. As South Africa develops towards a more coordinated industrialization era, Zalk showed that very substantial progress has been recorded and that most of the key action plans of the IPAP2 were on track. He however, called for increased engagement with other relevant government departments to facilitate fast tracking of these key action plans (Gamede, 2011).

4.3.8 The New Growth Path

The SA government under the leadership of the Minister of Economic Development Department, Minister Patel on the 23rd of November, 2010, adopted a developmental economic policy known as 'The Framework of the New Growth Path (NGP)'. Its adoption appeared to come at par with the rise to prominence of the ANC Youth League at that moment of SA's history (EDD, 2010). The NGP forms part of the country's medium-term growth plan, in which industrialization is outlined as one of its main objectives. The NGP was developed[156] with the goal of creating a more inclusive economic growth by placing the national economy on a labour-absorptive and production-led growth trajectory. The purpose of this drive was for tackling the country's developmental challenges of unemployment, inequality and poverty. The expected main indicators for the attainment of its objectives[157] should be evidenced in enhanced

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154 Workshop was organised by the DTI and the DMR in 2014.

155 He reiterated that the push for industrialization by government was done through the beneficiation strategy and the IPAP (Medupe, 2014).

156 Its development was drawn from the NDP, with the document giving details of the work that has to be done in order to achieve its objectives. According to the NDP (pg.117): "….the New Growth Path is the government's key programme (should read 'strategy') to take the country on to a higher growth trajectory" (Nkwinti, 2013).

157 As part of its objectives, the NGP highlighted the need:

1. To stimulate a constructive discussion about the country's economic priorities;
2. To rebuild the productive sectors of the economy, vis-a-vis improving the performance in terms of labour-absorption as well as the composition and rate of growth (EDD, 2010, pg. 1);
3. To focus on massive investment in infrastructure;
4. To identify structural challenges that impede desired growth rates. Some of these challenges are the still fragile global recovery; competition and collaboration with the new fast-growing economies; and competing interests domestically (Government of South Africa, 2010);
5. For the mining value chain, with particular emphasis on increasing the rate of mineral extraction and mineral beneficiation, to be singled out as one of its six focus areas needed as key job-drivers in SA (Medupe, 2014). It indicated that mineral beneficiation leading to final manufacture of consumer and capital goods can create large-scale employment. Thus, making beneficiation a priority growth node for creating five million new jobs by 2020 (Naidoo, 2012). According to Economic Development Department (2015), these jobs can be found in enhanced platinum group metal and coal exports and final manufacturing using base metal products;
6. To identify actions that the private sector, organised labour and government can undertake in this regard. It foresaw that stronger partnerships and smarter coordination between government, private sector and organised labour, will galvanise SA's resources in achieving the aims of the NGP (Government of South Africa, 2010).

economic growth, job creation, equity and environmental outcomes (ANC Youth League, 2010).

According to Kahn (2013), the NGP singled out mining with the aim of accelerating the rate of beneficiation of SA's mineral resources by:

a. "ensuring an effective review of the minerals rights regime;
b. lowering the cost of critical inputs including logistics and skills in order to stimulate private investment in the mining sector;
c. setting up a state-owned mining company which would concentrate on enhanced resource exploitation and beneficiation, which would co-exist with a strong private mining sector;
d. refocusing the beneficiation strategy on Stage 4 rather than smelting/refining;
e. greater utilisation of the mineral resource base of the country for developmental purposes, potentially through a sovereign wealth fund".

With attracting foreign investment in minerals beneficiation being an important objective of NGP for the purpose of reindustrializing the economy, SA had its eyes on raising the prospect of greater beneficiation reciprocity with the markets of the BRIC countries[158] – China, Brazil, and India. In light of this, as part of the comprehensive strategic partnership agreement signed by Presidents Jintao and Zuma, during Zuma's State visit to Beijing in August 2010, South Africa secured a "declaratory" commitment from China for "minerals beneficiation at source" reported by Dr. Davies[159] (Creamer, 2011).

The document appeared to portray SA as a "developmental state that will offer a worker's utopia, where 'decent' work will prevail, all inefficiencies will be resolved by the control of executive wages, and anti-competitive behaviours will be no more" (Kahn, 2013). However,

[158] As SA formally joined the BRIC countries, it was clearly "….keen to use all of these new relationships to try to get investment in value-added activities," Dr. Davies said (Creamer, 2011).

[159] Dr. Davies further asserted that "now we have to follow that through" by "….working towards is a framework for extracting more value from these mineral products and exporting higher value-added products to other countries, including China" (*idem*).

there were contrary views to this presentation which indicated that this presentation was problematic[160,161].

Furthermore, the NGP identified measures[162] to strengthen the capacity of the state and enhance the performance of the private sector to achieve employment and growth goals. Additionally, the NGP should be more clearly anchored on the pillar of pursuing a strategy of industrialization that includes identifying targeted sectors required in order to build a cohesive industrial base, as well as building linkages between these sectors in the overall growth and development strategy (COSATU, n.d.). It should also "outline the policy tools[163] that should be used to achieve the goals of macroeconomic policy" (COSATU, n.d.).

4.3.9 Beneficiation Strategy for the Minerals Industry of SA (Beneficiation Policy)

In June 2011, the Beneficiation strategy was adopted by DMR and by November 2011, the DMR action plan required to execute the beneficiation programme was in turn approved by Cabinet. Thus, making mineral beneficiation[164] a confirmed policy in SA. The development of this policy drew from a model[165] pioneered in the Nordic countries. In this context, the beneficiation policy proposed things like placing 'export/import duties' on some minerals and 'competitive pricing mechanisms' for certain industries (Naidoo, 2012). It gave an overview

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160 Kahn (2013) and COSATU (n.d.) stated that:
   a. its logic places knowledge and innovation in the far future, not considering the fact that even though these require very long periods to grow, they require immediate action;
   b. conceptual difficulties in its identification of 'core strengths' – capital equipment for construction and mining, 'heavy' chemicals, pharmaceuticals, software, green technology, and biotechnology – are displayed;
   c. NGP expects private business to be the leader of the job-creation process and economic growth, despite the document being designed to be a "state-led" program; business is a core driver of jobs;
   d. Negative actions on the part of labour and the State were not even acknowledged.

161 According to another contrary view, "the general assessment of the NGP document is that it does not represent a breakthrough in economic thinking and in economic policy", because like the IPAP, "the competing interests that drive economic policy act to limit focus" (COSATU, n.d. and Kahn, 2013). Thus, if the government does not prioritise its own efforts and resources more rigorously to support employment creation and equity, the NGP will fail (Economic Development Department , 2015).

162 One of such measures included changes to procurement policy and regulations (Government of South Africa, 2010).

163 Examples of such policy tools should be "concrete proposals on progressive taxation, regulation of short-term capital flows, foreign exchange controls, public procurement, etc. These should all be geared towards supporting industrial and social policy imperatives" (*idem*).

164 According to the DMR, "beneficiation, or value-added processing, involves the transformation of a primary material (produced by mining and extraction processes) to a more finished product, which has a higher export sales value". Beneficiation involves activities such as:
   - large-scale, capital-intensive activities such as smelting;
   - sophisticated refining plants; and
   - labour intensive processes such as craft jewellery, metal fabrication and ceramic pottery" (Govender, 2012).

165 From the comparative studies carried out to determine how the NORDIC countries realized beneficiation, it was observed that it is possible to achieve industrialization by leveraging on a country's natural resources when the government is the major driver of the beneficiation initiative.

of the current status of mineral beneficiation in the country, unpacked how the beneficiation strategy and its implementation plan was expected to change the status quo and leverage on the synergies of the provinces to contribute to balanced spatial economic development (DMR, 2013).

Prior to the adoption of the beneficiation policy, the DMR established the Beneficiation Economics Directorate[166] in 2005. The Beneficiation Strategy Development Unit was responsible for developing the mineral beneficiation strategy[167,168] that laid out the framework for translating SA's comparative advantage to competitive advantage (Framework is depicted in Figure 4.1). It is a critical instrument that is an elaboration of the beneficiation policy. It emphasizes the synergising and integration of existing beneficiation interventions in order to maximise the development impact.

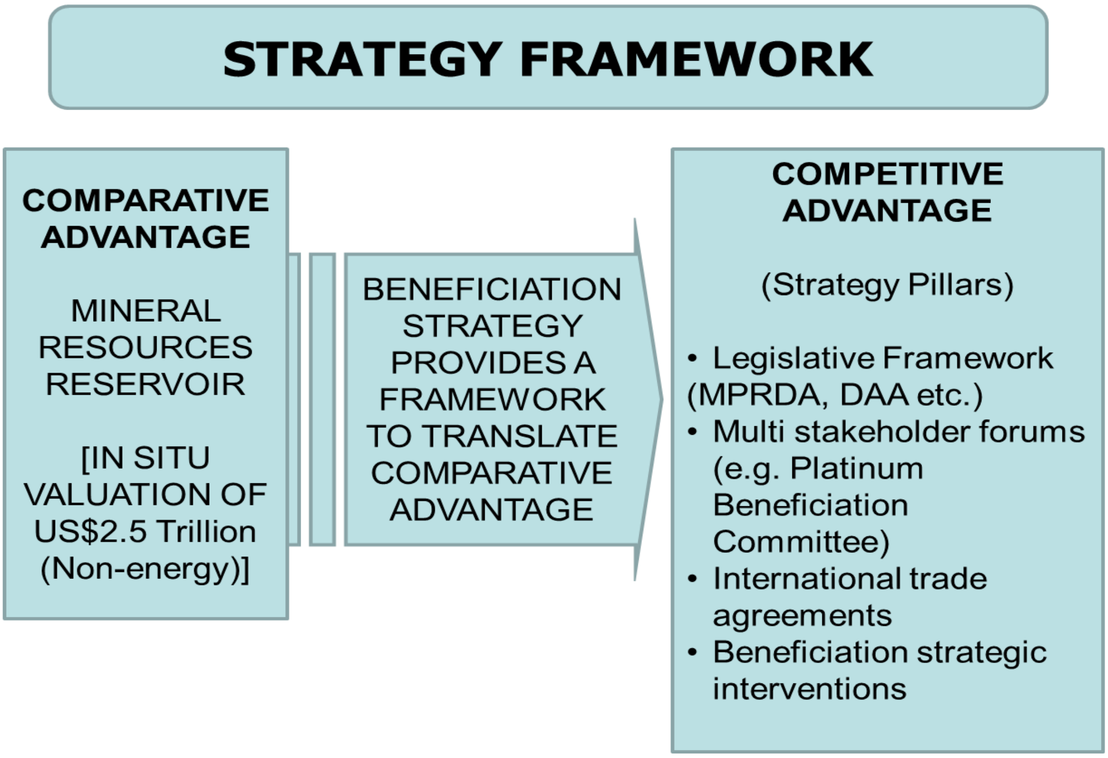

Figure 4.1: Beneficiation Strategy Framework. Source: DMR (2013).

166 This Directorate consists of the Beneficiation Business Development and Beneficiation Strategy Development units.

167 This strategy was developed to align with the national industrialization programme, "which seeks to enhance the quantity and quality of exports, promote the creation of employment and diversification of the economy, promote a green economy and strengthen the knowledge economy" (Govender, 2012).

168 This beneficiation strategy is rooted in several policies, including the MPRDA, the BBSEE, Precious Metals Act, Diamonds Amendment Acts, energy growth plan as well as compliance with environmental protocols. It also feeds into the ANC's 'State Intervention in Minerals Sector' report and made to compliment government programs such as the New Growth Path, NIPF (IPAP 2), energy security, skills development etc.

In light of the strategy's broad vision[169], it identified some of the instruments[170] that would facilitate an enabling environment for beneficiation (Govender, 2012). It also highlighted constraints to the implementation of beneficiation, whilst also outlining instruments available at Government's disposal for the mitigation of such constraints as well as the actions required by industry players. Examples of these instruments are stated in the Table 2 in the Appendix.

In the research study conducted in order to draw up the Beneficiation strategy, ten strategic mineral commodities were selected as part of Government Action/intervention Plan for more final stages of beneficiation. Based on these selected minerals, five value chains[171] (which includes mineral beneficiation up to the last stages of the value chain) were effectively prioritised as key economic activities to qualitatively demonstrate the highest value proposition of towards the attainment of its beneficiation objectives. However, the immediate priorities for implementation was expected to focus on the first two value chains of energy security and steel. Furthermore, so as to ensure the successful implementation of the strategy, it was indicated that the fiscal and regulatory environment must support the development of these selected value chains. In addition, the Beneficiation policy action plan offers incentives, such as a deeper skills pool, a favourable tax climate, lowering the cost of capital, and addressing the paucity of rail and energy infrastructure (Govender, 2012).

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[169] According to Department of Mineral Resources (2011b), its broad vision sought to:
- Give effect to the objects of the Mining and Minerals Policy of 1998;
- Elaborate the relevant provisions of the MPRDA;
- Increase a ratio of beneficiation extent to mineral production, thereby increasing export revenue;
- Facilitate industrialization and economic diversification through the optimisation of linkages in the mineral value chain;
- Expedite progress towards a knowledge-based economy;
- Create opportunities for new enterprise development;
- Contribute and support other developmental policies of government such as creation of decent jobs and poverty alleviation; and
- contribute to an incremental GDP growth in mineral value addition per capita in line with the vision outlined in the NGP, NIPF and the Advanced Manufacturing Technology Strategy (AMTS).

[170] Instruments such as policies, legislation, incentives such as taxes, funding and international trade agreements.

[171] These five value chains are:
1. Energy commodities and fuel cell technology: These involve activities such as clean coal mechanisms and coal conversion technologies, gas recycling and coal bed methane, Uranium and Thorium for nuclear reactors (Govender, 2012). These are needed for power production that would meet automotive, household and industrial purposes. The security and diversification of energy supply "will not only provide a new demand driver for these minerals, which the country possesses almost 70% of global share in reserves, but will also be a trailblazer in new, sustainable and renewable sources of energy for the future" (DMR, 2013).
2. Industry minerals such as Iron ore, manganese, chromium and steel: "the productive capacity and consumption of which constitute a critical element of economic development" (DMR, 2013).
3. Pigment and titanium metal production for the development of titanium dioxide pigment industry and metal fabrication.
4. PGM for autocatalytic converters and diesel particulate filters.
5. Jewellery manufacturing.

Even with this policy in place, the government acknowledges that beneficiation is not an event but a process with game-changing economic opportunities for South Africa. It also recognizes that even as the intensification of beneficiation represents win-win phenomenon for South Africa Inc. including participants across the various mineral value chains. It cannot pull off the beneficiation strategy without 'intensive co-ordination' across a range of departments, particularly mineral resources, economic development, trade and industry, science and technology, public enterprises, energy and the treasury, as well as business and labour (DMR, 2013 and Naidoo, 2012).

4.3.10 National Development Plan (NDP)

In 2012, the National Planning Commission (NPC) through Parliament and Cabinet, developed the National Development Plan. The NDP represents the long-term vision of SA: Vision 2030, while the NGP is government's strategy in pursuit of the Country Vision (Nkwinti, 2013). It sought to reduce unemployment by improving manufacturing within the country. In this country vision, catalytic projects termed 'Strategic Integrated Projects[172] (SIP)' were selected which have potential to fast-track development and growth (*idem*).

One of such SIPs placed emphasis on mineral beneficiation as being a significant contributor to improving its manufacturing sector. Although, the broad vision recognised that some beneficiation was already taking place in the country, it aimed at bolstering this, so that increase in export revenue, creation of job opportunities, advancement of manufacturing and economic growth, would be realized. In alignment to the vision of the NDP, the beneficiation strategy is expected to take good advantage of the opportunities open to SA for reducing raw exports and increasing export of high value-added products (Adams, 2013).

Despite the order in which the NDP came into being, it appears to have taken precedence over the NGP. This has therefore called for alignments between the NDP and the NGP, so as to avoid confusion as to the nature of the relationship between the two.

[172] According to Nkwinti (2013), these were developed in order to:
- "co-ordinate infrastructure build projects across all spheres and entities of government;
- facilitate solutions to related challenges and blockages;
- monitor progress, focusing on management information; and
- provide strategic support to responsible government departments and entities".

4.3.11 Mineral Value-chains Strategy

Dr. Jourdan[173] was appointed to pilot the conduction of the Mineral Value-Chains Strategy (MVS) research. According to Creamer (2013), the MVS research was for the purpose of orderly developing the country's mineral value chains through the following proposals:

1. "Encouraging the development of the mineral value chains to the point of final product manufacture where most of the labour-absorptive industries are located;
2. Strategies to increase forward value-addition of the four mineral groups selected, including the development of action plans for the value chains;
3. Designing regulatory provisions that could be incorporated into the amended MPRDA and the Mining Charter to promote access to raw material, which would assist in unlocking downstream industrial projects and facilitating higher levels of local content in the resources sector;
4. And determining instances were producer power could be exploited to facilitate industrial linkages".

This research was expected to identify the opportunities, as well as the regulatory requirements to realize those opportunities in particular value chains (Creamer, 2013). It was emphasised that the MVS was to be "closely calibrated" with the amendments to the MPRDA (*idem*).

4.3.12 Mineral and Petroleum Resources Royalty Act of 2008 (MPRRA)

The Mineral and Petroleum Resources Royalty Act[174] was based on the beneficiation-thinking objectives of the Mining policy of 1998 and the MPRDA 2002's provision for State custodianship over its mineral resources. The Act stipulates an additional rent-capturing system, which requires the charging of mineral royalties from mining companies, so as to ensure that the mining industry transcends to the benefit of larger sections of South Africans as required by the MPRDA (Oshokoya, 2012).

The provisions of this Act are such that mineral royalties are charged by using a dual *ad valorem*, sliding-scale formula mechanism. With this dual sliding-scale formula mechanism, no specific royalty rates are imposed for any mineral. In terms of facilitating beneficiation, the

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173 One of the authors of the ANC's SIMS policy document (Creamer, 2013).
174 MPRRA was promulgated in November 2008, but only came into force from March 2010.

mineral in question has to be classified either as a refined or unrefined mineral[175] before a royalty calculation is done. Hitherto, the formula provisions are such that a reduced royalty rate applies to refined minerals, as beneficiation increases (Oshokoya, 2012). The purpose of this is to compensate for the significant additional costs that is incurred as a mineral is refined, even though a refined product has higher sales value, which leads to a higher tax base than that of an unrefined mineral. Through the Act's definition of value, acknowledgment of profitability and automatic recognition of the downstream mineral beneficiation, this indicates that the royalty system aligns with the government's objective to promote local beneficiation of South Africa's minerals (Cawood and Minnitt, 2001 and Portfolio Committee on Finance, 2008).

4.4 SUMMARY OF THE REVIEW OF SA's BENEFICIATION-RELATED POLICIES.

In the previous section, some of the various mineral beneficiation-related policy instruments/initiatives that have been put forward by the SA government since the start of democracy in SA were highlighted and discussed. In this section, a summary of some of the main beneficiation initiatives of each of those policies are stated (see Table 4.1).

Table 4.1: The main beneficiation-related elements of SA's beneficiation policies.

Year	Policy Instrument	Comments
1994	The Reconstruction and Development Programme	• It posited that increased levels of mineral beneficiation could be achieved through appropriate incentives; • It also recommended that a future policy should facilitate the provision of more appropriate inputs for manufacturing in SA.
1998	Minerals and Mining Policy for South Africa	• It stated that government should be involved in the promotion of secondary and tertiary mineral-based industries, for the purpose of adding maximum value to raw materials; • It formed added basis for Government's Beneficiation Policy and strategy.

175 Refined minerals are listed in Schedule 1 of the MPRRA, while an unrefined mineral are listed in Schedule 2.

Table 4.1: The main beneficiation-related elements of SA's beneficiation policies (*continued*).

2002	Mineral and Petroleum Resources Development Act of 2002	• Legislative terms for mineral beneficiation were stated in Section 26 of the Act; • In the Act, the Minister was empowered to initiate or prescribe beneficiation levels of minerals in SA.
2004	South African Mining Charter	• It offered a regulatory incentive to mining companies that would support mineral beneficiation; • The offer – Mining companies would be able to offset the value of their beneficiation level achieved against the Mining Charter's requirement for 26% BEE ownership.
2005	Diamonds Amendment Acts, 2005 (Act No. 29 and Act No. 30)	It aimed at: • increasing access to rough diamonds for jewelry manufacturing in South Africa; • maintaining security of supply of rough diamonds; promote the beneficiation industry in SA; and • Increasing participation throughout the diamond value chain.
2005	Precious Metals Act 2005, Act No. 37 of 2005	This Act stipulates that the Minister is to only grant permission for the export of unwrought precious metals, after he/she is satisfied with the extent to which the applicant has facilitated access for local beneficiation.
2007	IPAP	• It aimed at promoting long-term industrialization and diversification beyond traditional commodities and non-tradable services, by focusing on expanding value-added production sectors; • The Government's industrial policy recognised that minerals are a vital input to an industrialization program; • It set out specific and detailed key actions and time frames needed to spur industrial growth; • It involved the development of a strategic action plan and timeframes designed to advance backward and forward beneficiation across five resource subsectors.

Table 4.1: The main beneficiation-related elements of SA's beneficiation policies (*continued*).

2008	MPRRA	• It stipulates a dual ad valorem, sliding-scale formula mechanism, in which a reduced royalty rate applies to refined minerals, as beneficiation increases; • To compensate for the significant additional costs that is incurred as a mineral is refined.
2008, 2012, 2013	Mineral and Petroleum Resources Development Act amendments	These Amendment Acts stipulated that: • the Minister of Mineral Resources has extensive discretionary powers to drive the State's beneficiation objectives; • the Minister of Mineral Resources has extensive discretionary powers to designate any mineral or mineral product for local beneficiation; • 'prescribed' price under the model of 'developmental pricing conditions' be changed to the concept of 'mine gate price or agreed price'.
2010	New Growth Path	• Industrialization is outlined as one of its main objectives; as well as • Attracting foreign investment in minerals beneficiation for the purpose of reindustrializing the economy.
2011	Beneficiation Strategy for the Minerals Industry of SA	Mineral beneficiation became a confirmed policy in SA through this initiative, • It proposed things like placing 'export/import duties' on some minerals and 'competitive pricing mechanisms; • It outlined the beneficiation strategy and its implementation plan; • It highlighted constraints to the implementation of beneficiation; • It outlined instruments available to Government for mitigation of such constraints as well as the actions required by industry players • It indicated that the fiscal and regulatory environment must support the development of these selected value chains.

Table 4.1: The main beneficiation-related elements of SA's beneficiation policies (*continued*).

2012	NDP	• It highlighted the long-term vision of SA – Vision 2030; • Mineral beneficiation is one of its SIPs, which is considered as a significant contributor to improving SA's manufacturing sector.
2013	MVS	• Its purpose is to orderly develop the country's mineral value chains; • Identify the opportunities, as well as the regulatory requirements to realize those opportunities in particular value chains.

Furthermore, a graphical representation of these beneficiation-related policy initiatives being juxtaposed next to each other and against the year in which they were introduced/instituted, is shown in this section. This comparison is illustrated in the Figure 4.2 in order to determine if there has been any trend in SA government's attitude/behaviour towards realizing its resource-based industrialization goal from a policy perspective.

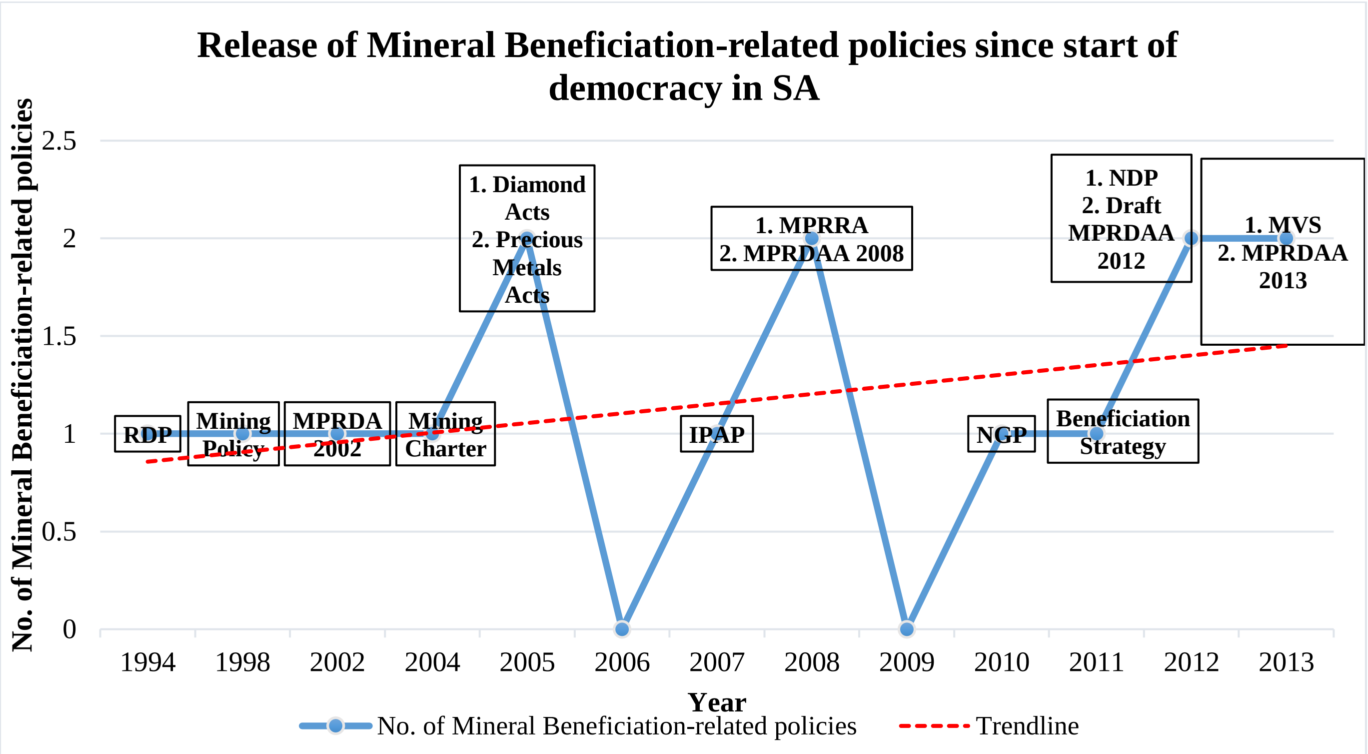

Figure 4.2: Trend in the establishment of mineral beneficiation-supportive policies since start of democracy in SA.

From the Figure 4.2, it can be observed that after the start of democracy in 1994, the SA government released at least one mineral beneficiation-facilitating policy document approximately after every four years. However, after the MPRDA was enacted in 2002, the frequency of the release of mineral beneficiation-supporting policy initiatives/instruments increased to almost every year (except in years 2006 and 2009, in which no such policy instruments were released). The trendline in the figure supports the observation that overall, there has been an increase in government's establishment of beneficiation policy initiatives.

Hence, it can be deduced that based on the number of these released beneficiation policy instruments as well as the frequency of their release within about 20 years, the SA government's keen expression of its pursuit to realize resource-based industrialization within the country is evident. This expression of government's industrialization pursuit is also indicative of the fact that its requirements for all beneficiation-related stakeholders to enable the realization of its policy objective has become more exertive over time. In the drive for more mineral beneficiation in SA, the institution of all these policy instruments/initiatives have been necessary and should succeed with proper implementation thereof.

4.5 CONCLUSION

In this chapter, SA's role as a 'developmental state' for the purpose of driving the goal of industrialising SA based on its mineral endowments in line with the RN concept, was discussed. In light of this, it was shown that pursuing the realising of more mineral **b**eneficiation activities appeared to be one of the most logical policy options available to SA[176]. Therefore, the chapter highlighted some of the trends and policy instruments that have be instituted over time to facilitate this cause.

In line with the objective of this research, the next chapter would narrow down the evaluation of the effectiveness of the various mineral beneficiation-related policies in SA to the MPRRA. The structure and application of the MPRRA in terms of facilitating the beneficiation objectives of SA, as well as the methodology needed to examine its effectiveness thereof, would be discussed in detail in that chapter.

[176] SA is a country that needs to address its critical socio-economic development concerns, unemployment and unsatisfactory economic growth issues.

CHAPTER FIVE

EXPOUNDING ON THE MPRRA BENEFICIATION POLICY INTENT AND RESEARCH METHODOLOGY.

5.1 INTRODUCTION

In previous chapters, it was discussed how the ideologies of RN, developmental state, 'terms of trade' and linkage development are increasingly causing SSA governments to realize that the low economic linkage status from their resources sectors, should and can be changed. In this vein, many of these governments are progressively instituting policies that would promote economic diversification and industrial development of their States, through the extension of economic linkages into and from their resources sectors (Oshokoya, 2012, chapter 3).

Against this backdrop, SA's linkage development policy instruments, amongst other SSA States, were discussed as a case in point in chapter four. It was highlighted that one of the main focus areas of such policy instruments is on the 'recent' call for greater local value-addition to SA's minerals through forward linkages – mineral beneficiation. Hence, a review of the provisions of some SA's mineral beneficiation-related policy instruments was carried out. For a comprehensive list of these policy instruments, see section 4.4 of Chapter four. It was deemed necessary not only to identify these mineral beneficiation-related policy instruments but also to evaluate their effectiveness going forward, so as to valuably contribute to the ongoing discussions of how they could better result in greater local mineral beneficiation. This evaluation would highlight which areas could be readjusted/modified to effectively realize the intended goals. In order to be fully in line with the objectives of this research, the MPRRA policy instrument has been singled out for such evaluation in this chapter. The expected result of this assessment is to obtain a lead into deliberations on which of its parameters need to be changed for government's goals to be achieved.

Furthermore, the methodology that would be used for this evaluation would be expounded in detail in this chapter. Before the methodology is discussed, the structure and application of the MPRRA in terms of facilitating the beneficiation objectives of SA government would be elaborated in this chapter.

5.2 THE MPRRA OF SOUTH AFRICA: Beneficiation provisions.

As mentioned in previous chapters, The Mineral and Petroleum Resources Royalty Act 28 of 2008 (MPRRA) was enacted on the basis of the provisions of SA's Minerals and Mining Policy as well as the Mineral and Petroleum Resources Development Act, 2002 (MPRDA[177,178,179]). Broadly speaking, the main objectives of the Act are as follows:

1. To compensate the State for the permanent loss of the country's non-renewable resources (PwC, 2009a). Royalty payments are for the benefit of the National Revenue Fund;
2. To target mineral rents; and
3. To facilitate the achievement of government's objective to promote local beneficiation of South Africa's minerals.

In order to develop this legislative instrument that would satisfy the above-mentioned objectives, some noteworthy issues were considered. Some of those issues included the facts that:

1. "in most instances, it is difficult to attach a value to a mineral at the moment when that mineral is extracted/mined";
2. the first saleable point/condition for most minerals is only obtained after such minerals have undergone a considerable amount of mineral processing and refining;
3. significant additional costs would be incurred when taking the mineral from ore extraction stage to processed/refined saleable state; and
4. "the gross sales value (i.e. the tax base) of a mineral increase, the longer that mineral undergoes processing in the value chain before being sold in its 'final' condition" (National Treasury, 2008).

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[177] MPRDA stipulates that South Africa's mineral resources belong to the nation and that the State is the custodian thereof.

[178] In terms of section 3(2)(b) of the MPRDA (as amended), the Minister of Mineral resources may prescribe and levy any fees payable to the State for these resources in consultation with the Minister of Finance, who, in terms of section 3(4) must determine and levy the State royalty by means of an Act of Parliament (SARS, 2016).

[179] With the MPRDA trying to monitor and control the depletion of SA's natural resources, it is widely held and additionally accepted by South African Revenue Services (SARS) that a mineral resource can only exist in a residue stockpile/deposit that was created in terms of the MPRDA (post 1 May 2004). Hence, SARS accepts that:
- Pre-1 May 2004 dumps do not attract a mineral royalty;
- Post-1 May 2004 dumps attract a mineral royalty. {until the MPRDA is amended} (Cohen, 2013).

These issues caused a decision to be made for royalty payments to be liable "at the time when the resources are transferred[180] or sold (or deemed to be sold)" (National Treasury, 2008). Another noteworthy decision made was that variable royalty percentage rates had to be applied to minerals "in one of two physical conditions - after some processing (unrefined minerals) or after the 'final' refined condition (refined minerals)" (*idem*). Hence, the Act was designed in the manner/form in which it currently exists. In establishing the sales value[181] of minerals through its *ad valorem*, sliding-scale formula[182] mechanism, this allows for profitability or loss to be acknowledged. Also, its dual formula design allows for the automatic recognition of downstream beneficiation of mineral products, as it distinguishes royalty rates for refined and unrefined minerals (Cawood and Minnitt, 2001). This differentiation[183] between refined and unrefined mineral resources by the Act, is based on the premise "that the State recognizes that beneficiation (the value-adding refining process[184]) is beneficial to the economy and thus should be incentivized", by making refined minerals to be subjected to a slightly lower royalty rate (Wainwright, 2014). The royalty payments collected through this legislative instrument represent an additional revenue stream to the government alongside corporate income tax receipts. Both royalties and CITs are payable in the same time cycle.

The provisions of the Act appeared to increasingly bring South Africa's mining legislation in line with prevailing international norms, in which taxation instruments are used not only for revenue collection but also to encourage or discourage the promotion of various economic sector initiatives (PwC, 2016a). Furthermore, with the Act consisting of other advantages/incentives, it served to form part of initiatives by SA's policy makers to instate a policy instrument that attempts to balance the satisfaction of both government and company objectives.

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180 "The term "transfer" acts as the trigger for the imposition of the royalty. A transfer occurs when an extractor for the first time disposes of or exports without sale a mineral resource or where its mineral resources (prior to sale) is lost, stolen or destroyed. A "transfer" arises upon export, because enforcement of a royalty becomes extremely difficult after mineral resources have left the country. The export point essentially becomes the last practical trigger point. A "transfer" arises only upon the initial disposal of beneficial ownership. Thus, mineral resources previously disposed of by way of a transfer are not subject to royalty a second time" (National Treasury, 2008).

181 "The decision to require royalty payments only at the time when the resources are sold (or deemed to be sold) takes into account the cash-flow position of the extractor liable for the royalty payments" (National Treasury, 2008).

182 "A formula approach was used for setting these rates as opposed to utilizing flat rates (e.g. a flat 3 per cent), thereby making these rates adjustable in light of business conditions" (National Treasury, 2008).

183 "The distinction between refined and unrefined mineral resources is important for determining both the royalty rate and the base" (National Treasury, 2008).

184 The premise that refined mineral resources "have higher gross sales value and therefore, a higher tax base than unrefined minerals, as more value addition occurs as minerals are refined" (Strydom, 2012).

Since its inception, it has changed the SA's mining administrative landscape and has had "a significant impact on a company's mining operations and accounting systems", as well as the mining investment climate of SA (PwC, 2016a). Hence, in accordance with the focus of this chapter, the next section expounds on the beneficiation-facilitation aspects of the Act.

5.2.1 The Beneficiation design parameters of the MPRRA

Although, the Act has seen some amendments since its inception, the general design parameters of the MPRR regime have not changed. Its structure generally covers the aspects that speak to: who is liable (source), when it is liable, and how much is liable - royalty base, royalty rate. For more details on the Act's structure/design, mechanism specifications, its modus operandi as well as all matters relating to the payment of mineral, see Appendix III.

For the facilitation of local mineral beneficiation in particular, the Act's design parameters are such that one of the two formula applies to all refined[185] and unrefined[186] mineral resources, whereby a reduced maximum royalty rate is payable for refined minerals as compared to unrefined minerals. Hence, the maximum royalty rate that is payable at maximum profitability (100%) for refined minerals is 5% of gross sales, in any given year of assessment. On the other hand, the maximum royalty rate payable at maximum profitability for unrefined minerals is 7% of gross sales. The factors/constants of 12.5 and 9.0[187] were chosen for the determination of the maximum rates for refined and unrefined minerals respectively. These constants represent the main difference between the formula for refined minerals versus the formula for unrefined minerals. Although an obligatory minimum[188] royalty charge of 0.5% of gross sales (irrespective of profitability or not) still applies for both refined and unrefined minerals, the reduced maximum royalty rate for refined minerals was given as a reward for the additional costs incurred on value addition (Oshokoya, 2012).

185 "Refined mineral resource: Refined mineral resources are mineral resources that have undergone a comprehensive level of beneficiation (e.g. smelting and refining)" (National Treasury, 2008).

186 "Unrefined mineral resource". Unrefined mineral resources are mineral resources that have undergone limited beneficiation (some processing)" (National Treasury, 2008).

187 According to MPRRB Explanation memo, these constants/factors were "decided upon to ensure a reasonable set of royalty percentage rates for unrefined minerals that is relatively higher than for refined minerals. The two constants effectively seek to neutralize some of the difference between the different refined versus unrefined mineral bases". The higher 12.5 constant seeks to offset this higher refined tax base resulting from higher gross sales, which arises as more value addition occurs when minerals are refined.

188 This minimum charge ensures that the government (as custodian) always receives some level of royalty payments for the permanent loss of non-renewable resources (Strydom, 2012);

In order to ensure that the appropriate royalty formula is used in determining the royalty payments liable at the point of transfer/disposal of any mineral, the category in which such a mineral falls under at that point must be obtained as specified in the Act. Minerals in their refined state are listed in Schedule 1[189] of the Act, whilst minerals in their unrefined state are listed in Schedule 2[190]. In addition to this, the Act acknowledges and makes provision for cases[191] in which a mineral resource can potentially/valuably be transferred either as a Schedule 1 product or Schedule 2 product. Those types of minerals are listed under both Schedules. Dual listed minerals are only viewed as "refined" if they are produced to the 'refined' or beyond the 'refined' condition specified in Schedule 1. On the other hand, dual listed that fail to meet schedule 1 specifications are viewed as unrefined (National Treasury, 2008).

Furthermore, for the purpose of further facilitating domestic refining purposes, the Act grants rollover relief for transfers of mineral resources by small and medium-sized local extractors that do not have the capacity to refine a mineral resource to completion. With such extractors often having to sell their mineral resources to other larger extractors with refining facilities, this relief enables the small extractor to "escape the royalty payment as the larger extractor assumes the potential royalty after refining the mineral (PwC, 2012). However, in order to benefit from this relief[192,193] both extractors must registered in terms of the Act.

5.3 THE 'PROBLEMATICS' OF THE ACT'S BENEFICIATION PROVISIONS

As alluded to previously, one of the objectives of the Act was to provide additional investment incentives[194] to beneficiation/refining developers so as to facilitate industrialization and

189 "Schedule 1 views a mineral resource as refined if that mineral resource is beneficiated into its purest form – metal slabs, ingots, bars, billets, plates consisting mostly of one mineral resource. For instance, copper is refined once processed into copper metal slabs consisting of 99% copper purity (National Treasury, 2008).

190 Schedule 2 views a mineral resource as unrefined if produced as concentrate or bulk material.

191 Such mineral has the potential of being produced and sold at final refined Schedule 1 condition, fails to reach this condition but can still be sold in its less refined form.

192 Registered persons in terms of the Mineral and Petroleum Resources Royalty Act.

193 To benefit from the relief offered, the transfer of the mineral resource must be done via a written agreement between the transferor and transferee that the rollover relief applies to the transaction (Strydom (2012); Cohen (2013)). This is as per section 8A of MPPRA. Hence, the receiver of the mineral resource will pay the royalty when he transfers the mineral resource (Cohen, 2013). In this case, the receiver (transferee) is then treated as the transferor who had won or recovered the mineral resource, thereby causing the royalty obligation to be deferred and rolled over to the transferee (Strydom, 2012).

194 Another example of such incentive is the 12i Tax Incentive, which aims to accelerate economic growth in the industrial sector and supports the Industrial Policy Action Plan (IPAP 2), Manufacturing Investment Programme (MIP). The MIP is an incentive designed to stimulate investment growth, in line with the South African government's National Industrial Policy Framework (DMR, 2011).

economic development that is highly needed in South Africa. However, the realisation of the positive influence of this objective on mineral investments has been widely debated over time.

The Chamber of Mines (CoM) has not been left out in the expression of scepticism to the beneficiation objectives of the Act and MPRDA section 26 amendment (as part of government's broad value-addition goal). Forthwith, it was stated that "while the CoM understands the concept of encouraging security of supply of minerals in the domestic market for domestic economic activities, which the government is pushing for, it does not support the concept of mining companies being compelled to subsidise the downstream manufacturing sector" (Chamber of Mines, 2013b). It opines that the mining industry[195] "cannot carry both *'market risk'*[196] and potential '*government pricing interference risk'* in terms of the developmental pricing[197] proposal" (*idem).* This was stated especially because these risks are proving to acutely affect the profitability of the mining business, more so in the face of the bouts of policy uncertainty (- the nationalisation debate, the review of mining taxation regime, the possible introduction of a carbon tax, etc.) that the mining industry has been facing in recent times. Hence, it calls for "the encouragement of greater beneficiation through the adoption of more pragmatic and realistic laws that improve the competitiveness of the downstream manufacturers as per global best practice" (*idem*).

These 'problematics' of the Act informs the rationale for the continuation/extension of the study evaluating the MPRRA's beneficiation provisions, with the aim of proposing 'pragmatic' and 'realistic' solutions/adjustments that need to be made to the regime. The next sections expound on the methodologies that have been and would be employed by the author for the purpose of obtaining anticipated pragmatic solutions.

195 "The Chamber believes this will significantly undermine funding for mining projects and transformation and is likely to curtail investment in the mining sector to the detriment of the country" (Chamber of Mines, 2013b).

196 Market risk arising from commodity price volatility and uncertainty as well as the interplay of other market forces – supply and demand, mineral substitution, re-use/re-cycling etc.

197 Developmental pricing proposal implies the situation whereby government stipulates supply price of raw minerals needed for further mineral beneficiation.

5.4 RESEARCH METHODOLOGY

5.4.1 Previous research's methodology

As referred to in Chapter one of this study, an attempt was made by Oshokoya in 2012 to assess the validity of the 'problematics' of the Act w.r.t. to realising its beneficiation objectives. In that study, the methodology used was based on the application of Bradley's model[198] to the SA mineral royalty context[199] (Oshokoya, 2012, Chapter 3). From that 2012 study, various deductions were drawn, which include the following:

1. Based on the WA royalty system's assumptions for the value-addition costs[200] needed to take extracted mineral products to the next stage of processing, Bradley concluded that investment in value-addition can only be justified when the difference between the sales price received for refined product and total production cost (concentrate production cost + value-addition cost) is significantly greater than the additional value-addition costs incurred. In other words, he specified that if the value of concentrate is 50% of sales price received for refined metal and additional value-addition cost is incurred to take concentrate to the next refined metal stage, the amount of financial value added must be significantly greater than this additional cost, or else it would not be worth-while investment to bring/add on a refining facility.
2. The crux of the matter is not that some value might not be added to the profitability of such operations that add-on mineral processing facilities based on the royalty incentive, but that whether the amount of value added was significant enough for such investment decision to be taken.
3. For the SA context, the royalty savings[201] in the model[202] created by Cawood (2011) did not pictorially appear to be significant[203] enough to justify the investment decision to add beneficiation facilities.

198 The results and recommendations from Bradley's 1986 Inquiry into the Mineral revenues in Western Australia (WA) w.r.t to the mineral processing incentive provisions of WA mineral royalty regime.

199 This borrowed from the model drawn up by Cawood (2011) which was based on his interpretation of Bradley's approach.

200 Value-addition cost being expressed as a share of price of final product.

201 Royalty savings depicted by the gap available to support value-add (Area B).

202 See Figure 3.3-2 and its explanation in Oshokoya (2012).

203 Royalty savings in Cawood model appears quite insignificant when compared to the Royalty savings (area A) in Bradley's model, as processing costs increase and one moves closer to the intersection.

4. Furthermore, Cawood (2011) carried out additional work[204] in which he varied different proportions of refinement cost, expressed as 10%, 20% and 30% of price[205] of final product against different target EBITs plus costs of concentrate, from 0% to 100%. This he did in order to determine the various levels of value-add (given as difference in price received less concentrate cost plus EBIT plus refining cost) that could be obtained. His findings were that significant value could be added if refining cost is 10% of final price; little value could be added when refining cost is 20% of price received; but no/negative value would be added when refining cost is 30% of price received. Therefore, it was drawn that if refining costs are above 20% of sales price, adding on refining facility would be of detrimental value to the miner-turning-refiner.

Through the econometric analysis carried out by Oshokoya (2012), the results of the combination of these models were then further used to evaluate the royalty payments paid by the South African platinum industry. This econometric analysis was carried out in order to check whether value would have been added to the financial positions of the Platinum mineral developers who decided to use the Royalty regime's provision of reduced royalty rate for mineral beneficiators as an incentive to go further in the value chain beyond mining only. The full details of the applied methodology, cash flow analysis on the platinum producer (used as a proxy for the platinum sector) as well as the economic analysis can be found in Chapters three and four of Oshokoya (2012). However, for the facilitation of the purpose of this current study, the synopsis of some of the results of the econometric analysis of Oshokoya (2012) are illustrated in the Figure 5.1 as follows:

[204] See Tables 3.3-1 to 3.3-3 and Figures 3.3-3 to 3.3-5 in Oshokoya (2012).

[205] Price received for refined product (indexed at 100%) expressed as a combination of cost of concentrate plus cost of refinement plus EBIT.

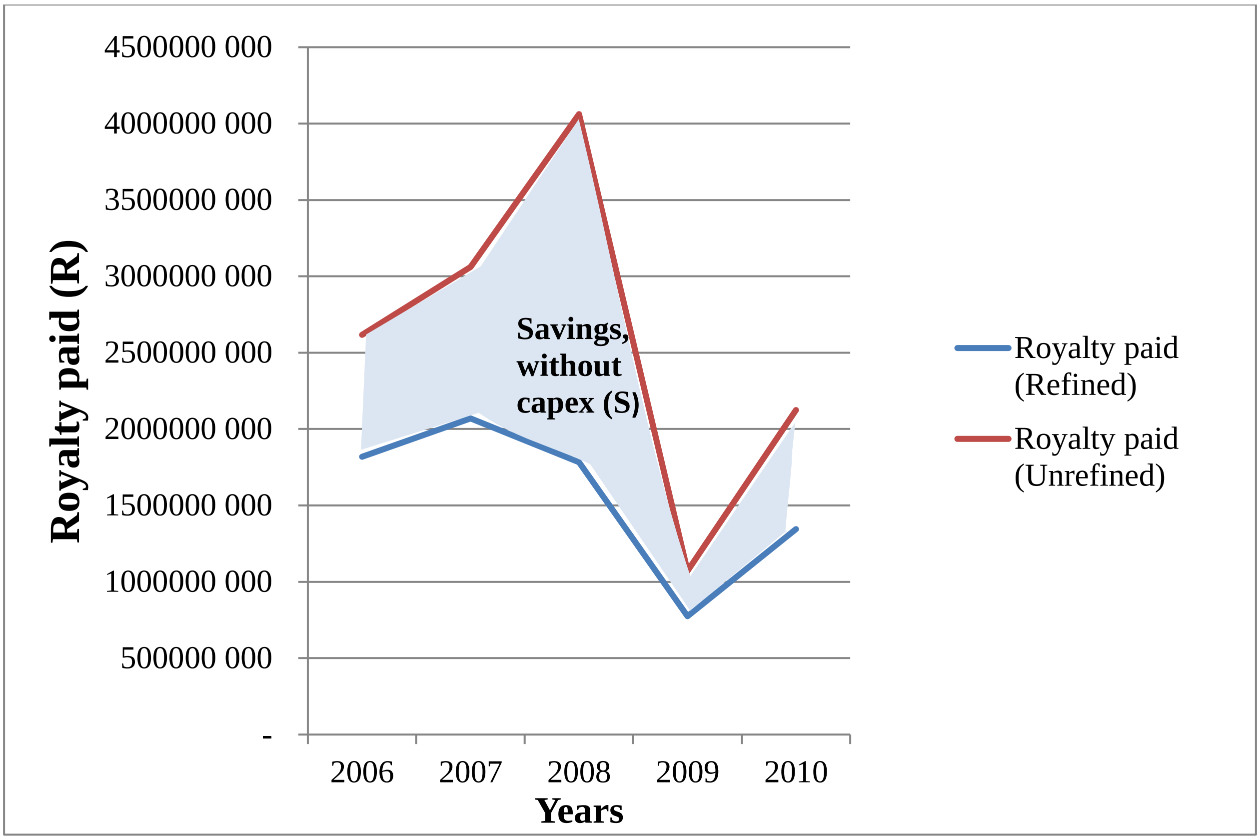

Figure 5.1: Royalty payments for both Refined and Unrefined PGM production, based on operating costs only. Source: Oshokoya (2012).

The Figure above was drawn from an initial scenario whereby operating costs only were used in the cash flow analysis, which resulted in the blue and red lines that represented the royalty payments paid by the miner-turned-refiner and the miner, respectively. Area S in the Figure is like Areas A and B in Bradley's and Cawood's models respectively, which represented royalty savings. In light of this 'operating costs only' analysis, it was observed that in all the years assessed, based on the beneficiation incentive provided in the MPRRA, the royalty savings that would have accrued if refining was taken on seemed significant. It also can be noticed that the blue and red lines which are based on the profitability of the company, flowed in tandem with the global economic situations of those years.

Additionally, in order to realistically check the effect of total costs (inclusive of capital (capex), which is imperative in the production process) on the royalty savings, Oshokoya (2012) carried out another scenario analysis in which she added on-going Smelting and Refining (S & R) capex to the analysis. This resulted in the green line seen in Figure 5.2. On addition of the green line, it was observed that there were still royalty savings in years 2006 and 2007 but the savings were wiped out from years 2008 onwards.

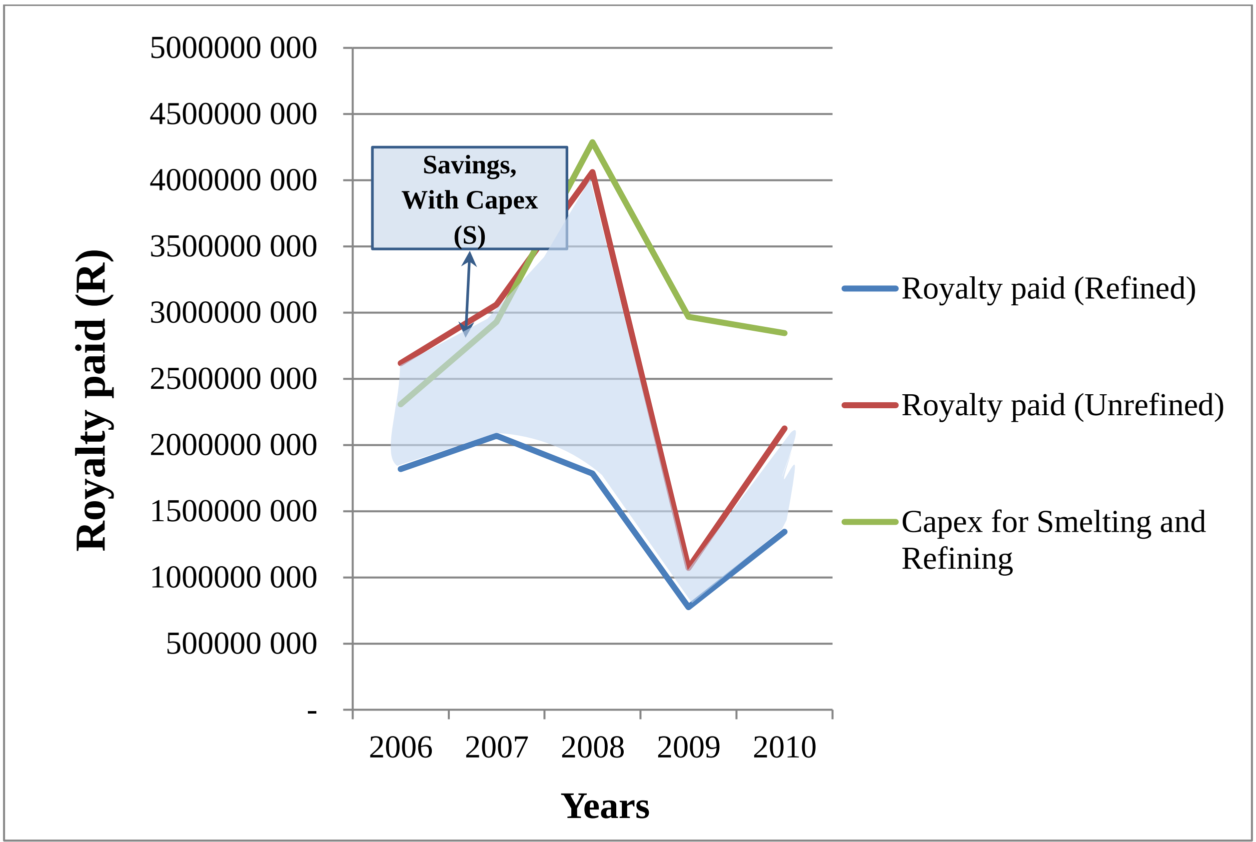

Figure 5.2: Effect of smelting and refining capex on area depicting royalty payment savings. Source: Oshokoya (2012).

Juxtaposing these analyses with the conclusions of Cawood's model, she found that in the scenario where operating costs only were used for all the years of assessment, the proportion of refinement costs as a percentage of sales price spanned between 15% to above 20% but less than 30%. In terms of value-add, this placed the producer in the second scenario (Figure 1..5 in chapter 1 of this study) of Cawood's work i.e. little value-add accrued to the producer, which was not more than the additional refinement costs needed for the process. With the other scenario in which S & R capex was factored in, the proportion of refinement costs rose to 30% and above for all the years of assessment. This implied that no value was added to the profitability of the producer in terms of the MPRRA's beneficiation provisions.

In these base case scenarios where actual values reported in the financials of the platinum producer were used, after checking the 'before and after' effects of applying the royalty formula on EBIT and profitability, she deduced that in both good and bad times it was more advantageous for miners to produce concentrates rather than refined products. Therefore, the conclusion was that the royalty regime would not encourage miners to become refiners.

Furthermore, to further validate this conclusion, she went ahead to carry out another scenario analysis to assess the effect if the refiner was conservative in terms of smelting and refining capital expenditure. The S & R capex for all the years except that of year 2008 were averaged and it resulted in a value of R 1.261 billion. This value was applied to the cash flow and the outcome is shown in Figure 5.3.

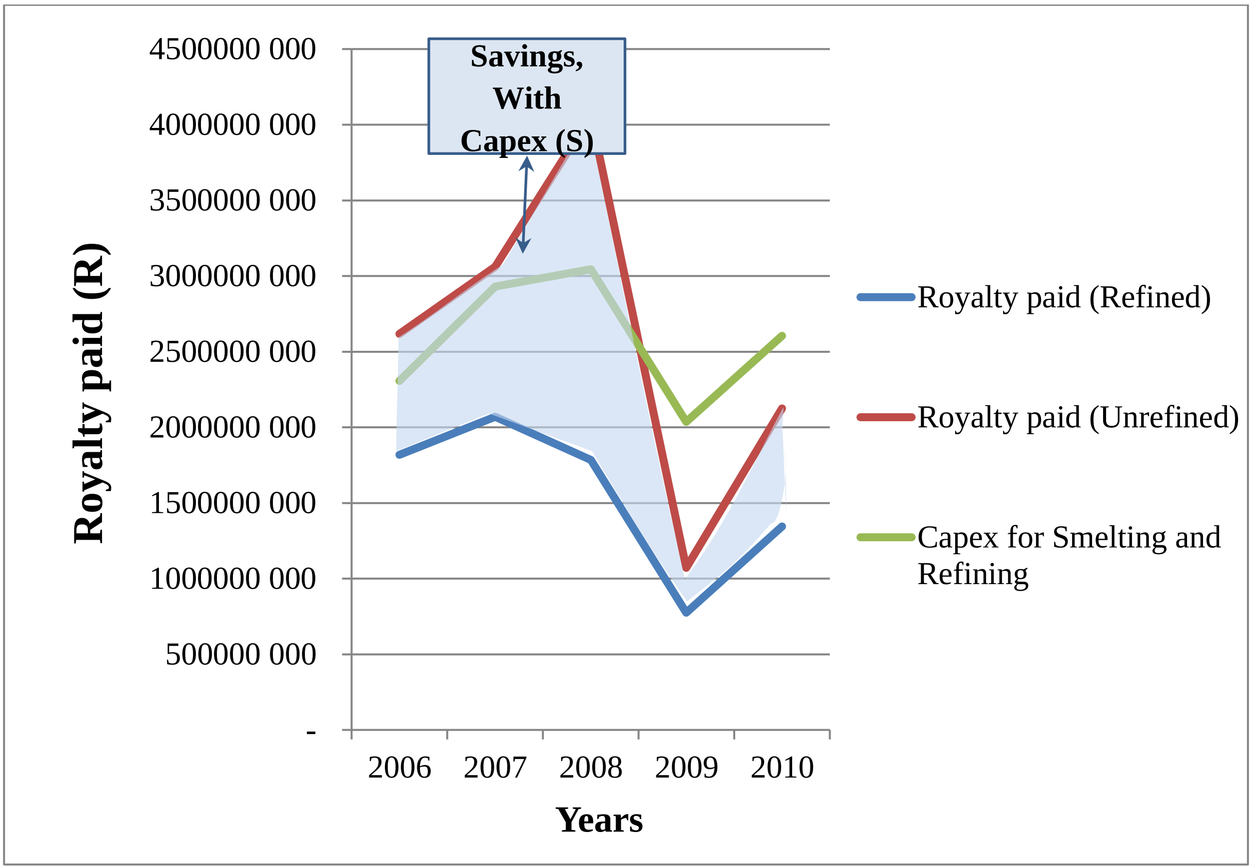

Figure 5.3: Effect of conservative smelting and refining capital expenditure on royalty payment savings. Source: Oshokoya (2012).

From the Figure above, it can be observed that if a producer had moderately incurred smelting and refining capital costs in years 2006 to 2008, value would have been added to the miner-turned-refiner's financial position. However, for 2009 and 2010, even with conservative capital expenditure, the regime's provision for refined production would still have remained a disincentive for spending the refinement capital. From this conservative scenario analysis, it was logical to imply that the regime's beneficiation incentive could only encourage miners to become refiners under special circumstances like during commodity boom periods.

In concluding that study, Oshokoya (2012) stated that in general, the MPRRA's beneficiation incentive did not appear to be sufficient enough and was unlikely to encourage platinum miners to become refiners. She further stated that because the equitability and efficiency characteristics of the MPRRA was briefly demonstrated to be quite positive, and that the beneficiation provisions appeared to be able to realize the mineral beneficiation objective of the SA government under special conditions, she recommended that this initiative should not be discarded. Instead, one of the recommendations of the 2012 study was for further investigation to be carried out into checking how the parameters of the MPRR regime could be adjusted[206] to incentivise the cost-side of mineral developers. This was proposed based on the reality that mineral producers are largely price-takers (hardly having control over the prices received for their products), coupled with the current difficulty they have been facing as regards being able to curtail their production costs[207].

5.4.2 Current research's methodology

In light of the findings and recommendations of Oshokoya's 2012 study, this current research is henceforth an extension of that study, with the aim of assessing how adjusting the parameters of the royalty regime would change the results of the study (including changing Figures 5.1 – 5.3), so as to facilitate the achievement of policy objectives. In order to adequately carry out the assessment of how the parameters of the royalty regime can be adjusted, the methodology of this study aimed at addressing some of the shortcomings of the 2012 study. Some of these shortcomings include the type of financial data that was obtained and used in the 2012 study, as well as the financial/accounting calculations that were carried out.

Due to confidentiality issues, the actual relevant mining and refining financial data from the platinum producers could not be obtained for the 2012 study. Hence, the information used for the analysis of that study were obtained from financial reports made available on public

206 "Adjusting the parameters and improving the design of the MPRR regime so that as much as possible it becomes more favourable to the addition of beneficiation capital costs (refinement costs in general), in all economic cycles" (Oshokoya, 2012).

207 The achievement of such conservativeness seems to be hindered by many factors which are unique to their individual operations, as well as prevailing political, infrastructural and socio-economic factors.

domain. This information had the limitations of not being as detailed as required in terms clearly defining/breaking-down the different relevant mining/refining/processing revenues and costs. Also, at the time of that study, it was difficult to obtain capital costs for establishing smelting and refining facilities, which would have been needed to optimally assess the significance of the magnitude of royalty savings.

For this current study, it was expected that those confidentiality issues encountered in 2012 study would be placated at the beginning stages of the study so that actual financial data for revenue, costs and new processing facility capex could be obtained and used so as to portray much closer to real-life financial positions of producer(s). To this end, both the DMR and SARS were approached between January and March 2017. At the DMR, a “request for access to records” application was lodged in March 2017, but this application was refused in that same month. The reason for refusal was stated as follows:
“…in terms of Section 36 (1) (b) subject to subsection (2) of the Act [Promotion of access to Information Act No. 2 of 2000], the information officer of a public body must refuse a request for access to a record, if it contains financial information of third parties”.

With SARS being approached in January 2017, a response was only received in March 2017. The response was a refusal of the request for financial information of the mining companies and referral was made for the researcher to use related documents available on public domain. Therefore, the limitation with respect to obtaining requisite information due to confidentiality issues that was experienced in the 2012 study was encountered in this current study. Hence, information for this study had to be obtained from public domain (Annual reports, Analyst books etc.) as directed by SARS.

5.4.2.1 Model parameters and specifications

For the purpose of this study, the analysis would be carried out using models created through Microsoft Excel and IBM SPSS Statistics. The parameters that would be used in this model are described with sample illustrations as follows:

- Gross sales[208]: This is defined as arm's length gross sales value in the transfer[209] of all mineral resources in the condition specified in Schedule 1 or 2 of the Act (PwC, 2009b). For all Schedule 1 (refined) and Schedule 2 (unrefined) mineral resources, their respective gross sales calculations are carried out separately. However, the rules for calculating gross sales for Schedule 1 and Schedule 2 minerals "mirror one another" (National Treasury, 2008). In calculating gross sales, where available, the quantity of mineral sold, recovery rates, unit prices received and foreign currency conversion rates, are some of the key inputs needed. They are **multiplied together** to arrive at the gross sales amount. Furthermore, various inclusions and as well as exclusions are applicable for aggregating gross sales. Some of the exclusions include:
  - Amounts received regarding transport, insurance and handling of mineral after condition specified;
  - Foreign exchange gains (Cohen, 2013).

Samples of gross sales calculation can be seen in the Tables 5.1a and b:

Table 5.1a: Sample Gross sales/revenue calculations for Gold (refined mineral) case.

Refined mineral (Gold) case				
	Units	**2006**	**2007**	**2008**
Production tons	t	120,000	240,000	240,000
In situ grade	g/t	5.0	4.5	4.0
Recovery factor	%	90	85	85
Recovered kilograms = $\frac{t*(g/t)*\%}{1000}$ = A	kg	540	918	816
Gold price received	$/oz	495	510	525
Exchange rate	$/R	8	8.5	9
Gold price (($/oz) *($/R)*32.15) = B	R/Kg	127,371	139,392	152,019
Gross Sales/revenue (G) = A* B	R	**68,780,115**	**127,961,959**	**124,047,262**

Source: Adapted from Macfarlane (2005).

208 This is the royalty base.

209 As amended, Transfer is very widely defined as:
(a) the disposal of a mineral resource; or
(b) ………. (deleted)
(c) the consumption, theft, destruction or loss of a mineral resource, other than by way of flaring or other liberation into the atmosphere during exploration or production if that mineral resource has not previously been disposed of, consumed, stolen, destroyed or lost (Wainwright, 2014).

Table 5.1b: Sample Gross sales/revenue calculations for unrefined PGM case.

Unrefined mineral (PGM) case				
	Units	**2006**	**2007**	**2008**
Tonnes milled	t	43,792,000	41,563,000	42,611,000
Head grade	g/t	3.8	3.6	3.4
Recovery factor	%	98	98	98
Recovered metal = $t * \left(\frac{g}{t}\right) * \% = \mathbf{R}$	g	163,510,570	147,856,216	140,309,501
Metal in concentrate (Recovered metal) $= \frac{R}{31.1034}$ **= A**	oz	5,257,000	4,753,699	4,511,066
Prices received = B	R/oz	7,114	9,200	12,863
Gross Sales/revenue (G) = A*B	**R**	**37,398,297,039**	**43,734,035,155**	**58,025,846,332**

Source: Adapted from Oshokoya (2012).

Additionally, in terms of the Act, gross sales calculation for minerals that are produced with by-products is neither performed mineral-by-mineral nor category-by-category. Instead, gross sales for this case is realized by aggregating[210] all refined mineral resources transferred by an extractor and checking the condition of the main mineral against the Schedules so as to apply the appropriate royalty formula (National Treasury, 2008). Another noteworthy issue in calculating gross sales value especially for minerals that are not dual listed is that of disposals[211] that occur at a condition that differs from the specified range/condition in the Schedules. This situation requires that some adjustments must be made to the gross sales value. As described in the MPRRB Explanation memorandum, this situation can be solved in either of two ways (National Treasury, 2008). These include receipts and actual accruals either being adjusted by way of a specified procedure in which the sales amount is increased/decreased by a factor; or those actual figures are ignored, whilst an arm's length price at the specified condition is used instead. The resolution of this kind(s) of situation by the usage of

[210] More specifically, the value of by-products of a mineral resource (refined or unrefined) within one schedule may be aggregated into the other schedule for EBIT purposes as long as these by-products do not exceed 10 percent of the total

[211] i.e. sales and other disposals of beneficial interests (National Treasury, 2008).

either of these two options is for the purpose of ensuring “that mineral resources are not artificially sold below appropriate arm’s length prices, thereby undermining” what is due as royalty receipts (National Treasury, 2008). The Tables 5.2a and b below illustrate the cases whereby the factor adjustment procedure option is used when:

a. A mineral is disposed of at a purity level that is below the stipulated condition/range in the Schedule(s), whereby the receipts or accruals rule (of section 6(1)(a)) must be adjusted. The gross sales amount will be adjusted (increased) by a factor equal to the lower limit of the purity level specified **divided by** the purity level it was sold at, in order to arrive at the estimated sales value, as if the mineral were disposed of at the specified purity level (i.e. the Schedule 1/2 condition) on the same date.

Table 5.2a: Factor adjustment procedure for sales of mineral below condition specified.

Mineral	Specified range		Unit	Sold at	Ratio
Gold	99.5%		Au	98%	101.5% i.e. $(\frac{99.5}{98})$
Chrome Ore	37%	46%	Cr_2O_3	34%	108.8% i.e. $(\frac{37}{34})$
Manganese	37%	48%	Mn	35%	105.7% i.e. $(\frac{37}{35})$

Source: Adapted from National Treasury (2008).

b. A mineral is disposed of at a purity level that is above the stipulated condition/range in the Schedule(s), whereby the receipts or accruals rule (of section 6(1)(a)) must be adjusted. The gross sales amount will be adjusted (decreased) by a factor equal to the upper limit of the purity level specified **divided by** the purity level it was sold at, in order to arrive at the estimated sales value, as if the mineral were disposed of at the specified purity level (i.e. the Schedule 1/2 condition) on the same date.

Table 5.2b: Factor adjustment procedure for sales of mineral above condition specified.

Mineral	Specified range		Unit	Sold at	Ratio
Iron Ore	61%	64%	Fe	66%	97% i.e. $(\frac{64}{66})$
Chrome Ore	37%	46%	Cr_2O_3	48%	95.8% i.e. $(\frac{46}{48})$
Manganese	37%	48%	Mn	50%	96% i.e. $(\frac{48}{50})$

Source: Adapted from National Treasury (2008).

As mentioned previously, the Act has seen some amendments to its provisions in recent past. The ITAA explanatory memorandum made it clear that the proposed amendments were aimed at a range of minerals and coal specifically. Some of these amendments are to be take into consideration when calculating gross sales and/or grossing up/down of gross sales value(s). Some of these details w.r.t to the sources of the amendments and contents thereof can be found in Appendix III.

According to KPMG (2013), although it was claimed that the amendments would clarify how mineral resources with a specified condition that falls within a range would be handled for purposes of determining the gross sales value, effectively, this was not achieved. This was due to fact that the amendments appeared to "yet again confuse three concepts, which in the determination of the gross sales" (KPMG, 2013). Nonetheless, the expected result of the amendments to the Royalty Act is "less in the nett for extractors and more in the National Revenue Fund" (Wainwright, 2014).

- EBIT: This is defined as earnings before interest and taxes. EBIT measures an extractor's net operating profits from mining, with the exclusion of tax definitions (Strydom, 2012). As with gross sales, EBIT calculation is aggregated separately for refined and unrefined minerals. Its calculation is realized from the sum of gross sales after adding recoupments under Income Tax Act 1962 (ITA) less all deductible expenses - operating expenditure, capital expenditure and any other amounts that are deductible in terms of the ITA, which relate to all refined mineral resources (or unrefined as the case may be), in the year incurred. It should be noted that the allowable deductions are "permitted only to the extent that those deductions[212] contribute toward bringing mineral resources to their applicable Schedule 1 or Schedule 2 condition[213]" (National Treasury, 2008). According to Strydom (2012) and Cohen (2013), some exclusions are applicable, which include:
  - other charges or deductions in respect of financial instruments as defined in the ITA (other than option contracts, forward contracts[214] or other instruments, the value of which is derived directly or indirectly with reference to mineral resources);
  - interest deductions from debt and the cost of carrying derivatives;
  - Expenditure incurred on transport, insurance and handling[215] after condition specified;
  - Carry forward of assessed loss;
  - Foreign exchange losses;
  - The royalty payment; and
  - All other costs incurred beyond the refined/unrefined specified condition (including transport, environmental rehabilitation costs etc.).

212 In other words, allowable deductibles are limited to those costs incurred for the mineral to reach the refined condition (including transport, etc.). "Similar principles apply to unrefined mineral resources (National Treasury, 2008).

213 "For example, if a mineral resource is using a Schedule 1 based formula, only deductions relating to the cost incurred for preparing the mineral resource to reach its Schedule 1 condition are deductible (National Treasury, 2008).

214 Strydom (2012) stated that "the costs from mineral resource hedges (forward contracts) are deductible, because these hedges act as an economic offset against mineral resource gross sales".

215 "The EBIT deduction cut-off to a specified condition is clarified in respect of transportation, insurance and handling. Costs of this kind after the applicable condition are not deductible" (National Treasury, 2008).

A noteworthy issue in EBIT calculation is the fact that "*under this arm's length pricing rule, the Commissioner is empowered to adjust and substitute net earnings that are otherwise taken into account for EBIT. This adjustment may be directed at any factor of net earnings (i.e. gross sales, recoupments and deductible expenditures). For instance, this rule ensures that net earnings in respect of mineral resources sold at condition specified (and in respect of mining assets used to sell those mineral resources) are derived at by using appropriate arm's length prices so as not to undermine the royalty. This rule also ensures that mineral resources are not artificially sold below appropriate arm's length prices, thereby undermining the royalty*" (National Treasury, 2008). Samples of EBIT calculations can be seen in the Tables 5.3a and b below:

Table 5.3a: Sample EBIT calculations for refined PGM case.

Refined mineral (PGM) case				
	Units	**2006**	**2007**	**2008**
Gross revenue (G)	R	39,356,000,000	46,961,000,000	51,118,000,000
Mining costs (C_m)	R	12,983,000,000	16,125,000,000	20,243,000,000
Smelting costs (C_s)	R	1,238,000,000	1,314,000,000	1,625,000,000
Treatment and Refining costs (C_r)	R	915,000,000	1,047,000,000	1,151,000,000
EBIT before Royalty = G – (C_m+ C_s+ C_r)	R	24,220,000,000	28,475,000,000	28,099,000,000
Ongoing capex (Mining + Refining) (CA_{mr})	R	6,050,000,000	10,162,000,000	12,592,000,000
EBIT after capex redemption (E) = G – (C_m+ C_s+ C_r+CA_{mr})	R	**18,170,000,000**	**18,313,000,000**	**15,507,000,000**

Source: Adapted from Oshokoya (2012).

Table 5.3b: Sample EBIT calculations for unrefined PGM case.

Unrefined mineral (PGM) case				
	Units	**2006**	**2007**	**2008**
Gross revenue (G)	R	37,398,297,039	43,734,035,155	58,025,846,332
Mining costs (C_m)	R	12,983,000,000	16,125,000,000	20,243,000,000
EBIT before Royalty = G – (C_m)	R	24,415,297,039	27,609,035,155	37,782,846,332
Ongoing capex (Mining only) (CA_m)	R	5,561,000,000	9,302,000,000	10,088,000,000
EBIT after capex redemption (E) = G – (C_m+CA_m)	R	**18,854,297,039**	**18,307,035,155**	**27,694,846,332**

Source: Adapted from Oshokoya (2012).

As in the case of gross sales calculation for minerals that are produced with by-products, EBIT calculation also is not performed mineral-by-mineral or category-by-category.

- Royalty amount payable: For refined or unrefined mineral resources transferred by an extractor, the Rand amount of royalty to be paid is obtained by **multiplying** gross sales[216] for transferred refined mineral resources **by** the calculated royalty percentage rate[217]. See Tables 5.4a and b for sample royalty rate and royalty amount calculations.

Table 5.4a: Sample royalty rate and royalty amount calculations for refined PGM case.

Refined mineral (PGM) case				
	Units	**2006**	**2007**	**2008**
EBIT after capex redemption (E)	R	18,170,000,000	18,313,000,000	15,507,000,000
$\frac{\textbf{EBIT (E)}}{\textbf{Revenue (G)}}$ **before royalty = X**	%	46.2	39	30.4
Refined royalty rate = $\mathbf{Y\%} = 0.5 + \left(\frac{X}{12.5}\right)$	%	4.2	3.6	2.9
Royalty paid = Y% * G	R	**1,650,380,000**	**1,699,845,000**	**1,496,150,000**

Source: Adapted from Oshokoya (2012).

216 As calculated as per above description based on section 6(1) of Act.

217 Determined as applicable formula based on section 4(1) specifications.

Table 5.4b: Sample royalty rate and royalty amount calculations for unrefined PGM case.

Unrefined mineral (PGM) case				
	Units	**2006**	**2007**	**2008**
EBIT after capex redemption (E)	R	18,854,297,039	18,307,035,155	27,694,846,332
$\frac{\textbf{EBIT (E)}}{\textbf{Revenue (G)}}$ **before royalty = X**	%	50.4	41.9	47.7
Unrefined royalty rate = $\textbf{Y\%} = 0.5 + \left(\frac{X}{9}\right)$	%	6.1	5.2	5.8
Royalty paid = Y% * G	R	**2,281,913,378**	**2,252,785,193**	**3,367,334,380**

Source: Adapted from Oshokoya (2012).

5.4.2.2 Specifics of the current study's econometric analysis.

In terms of the econometric calculations done in the 2012 study, only a 'simple' mathematical method was applied to the financial data. In this current study, an additional statistical method is applied for the econometric analysis. Based on the data obtained as at the time of current study, the methods employed in this study involved carrying out econometric analysis in two phases. Both phases were applied to three other mineral sectors/industries as well as the PGM sector (as in the 2012 study). The specifics of how the econometric analysis of this study has been modified to differ from that of 2012's study are as follows:

1. The two phases of econometric analysis are:
   a. Econometric analysis phase 1: This phase involved the use of a statistical method – independent samples Test, to determine the statistical relationship and magnitude thereof (if any) between royalties paid by refined mineral producers (also referred to as miner-turned-refiner or refiner) and royalties paid by unrefined mineral producers (also referred to as miner-only or miner). The software used for this phase was IBM SPSS Statistics. The details of how Phase 1 was conducted can be found in Appendix IV.
   b. Econometric analysis phase 2: This phase involved comparing the magnitude of the royalties paid by refined mineral producers with the royalties paid by unrefined mineral producers to determine if the MPRRA's beneficiation incentive provision yielded any significant monetary value (hereinafter referred

to as "Realized Beneficiation incentive[218,219]") to the refiner for the additional refinement costs that he incurred. This phase is similar to the singular method used in 2012's study. The software used for this phase was Microsoft Excel.

2. This current econometric analysis dealt with the years assessed in 2012 study (except for 2006 due to unavailability of requisite 2006 data for all the commodities assessed) and was updated to include years from 2011 until 2015. Although this current study began in 2013, the data analysis aspect only commenced in early 2017. Therefore, for the purpose of suitable comparability, it was quite a challenge to obtain comprehensive industry and/or financial data beyond the year 2015 from all the public sources used as at this time of study. For instance, a data source like PwC had information on the leading commodity sectors for 2016 (presented in Chapter six), whereas CoM (another data source used to derive similar information), did not have these information readily available on public domain beyond 2015. This limitation informed the use of year 2015 as the 'capstone' year as at the time of data gathering and processing of this research (mid-2017).
3. The analysis was applied to other commodity sectors apart from PGMs like gold, iron ore and coal. This was done to ascertain a fair idea of whether the conclusion of the 2012 study was PGM industry-specific or also applicable to the entire SA mining industry.
4. The results/findings from this current econometric analysis informed the next stage that sought to adjust the parameters of the regime. Various policy option assessments were carried out to ascertain the most optimal way of adjusting the parameters of the royalty regime. These different ways included reduction of the maximum rate for refined minerals; and/or manipulating the F-factor of 12.5 (which determines the maximum rate for refined rate). Another consideration (not implemented in this study) was the manipulation of the royalty base to allow for deduction of some costs[220] (- marketing, transport, other operating and/or capital) attributed to refining; i.e. Net Smelter Revenue option/calculation.

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218 Note: This was referred to as "royalty savings" in Oshokoya's 2012 study.

219 It is important to note that the ability of the companies that were assessed to gain 'Realized Beneficiation Incentive' or not in all the years of assessment, was not only dependent on the nature of the Royalty regime but largely dependent on the peculiar impact of other factors on the 'yearly' sales prices/revenues of those companies and production costs they incurred. Some of these significant factors include production quantities, economic trends (both on micro and macro levels), geopolitical trends, market behavior, productivity/labour behavior etc.

220 "Incorporating incentives for refinement capital costs may allow the reduced royalty rate provisions for refined minerals to significantly add value and encourage miners to become refiners" (Oshokoya, 2012).

On the application of these econometric procedures, the possibility of using the beneficiation provisions of the royalty regime to result in much more significant realized beneficiation incentive accruing to producers in both good and bad profit years, was assessed. Figure 5.4 gives a simple pictorial illustration of the expected result of such ‘possibility’ assessment.

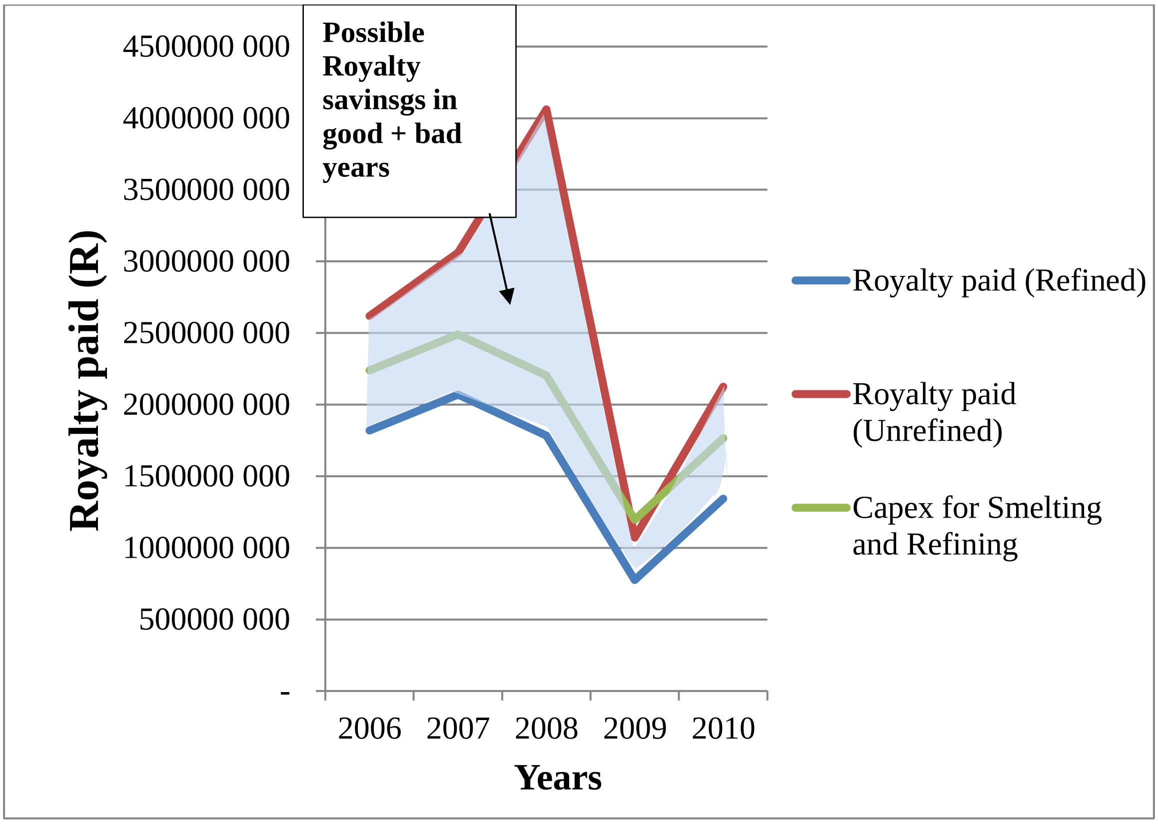

Figure 5.4: Pictorial illustration of a scenario analysis of the possibility of realized beneficiation incentive in both good and bad profit years. Source: Adapted from Oshokoya (2012).

5.5 CONCLUSION

In this chapter, the various aspects of the Act, its design parameters as well as its modus operandi, were expounded on. Some of the proposed amendments to the Act as well as some of the identified concerns/problems with respect to its revenue-collection and beneficiation provisions were also stated in this chapter. It was mentioned that concerns/problems like this have informed the government’s promise to engage in conducting continuous comprehensive studies and evaluations of the current taxation regime, so as to obtain the various policy options available.

As part of ways to contribute to such evaluative studies, this informed the rationale for the continuation of the 2012 study that involved evaluating the MPRRA's beneficiation provisions. In this chapter, both the methodology used in the 2012 study as well as the methodologies for the current study, were highlighted. The current study's econometric methodologies aim at working towards the proposition of 'pragmatic' and 'realistic' adjustments that can be made to the royalty regime, such that significant realized beneficiation incentive[221] enough to encourage miners to become refiners, could be achieved.

The next chapter would highlight and give justification for the commodities sectors chosen as suitable case studies for the purpose of assessing if the MPRRA will sufficiently motivate miners to become refiners.

[221] Recall: "It is important to note that the ability of the companies that were assessed to gain 'Realized Beneficiation Incentive' or not in all the years of assessment, was not only dependent on the nature of the Royalty regime but largely dependent on the peculiar impact of other factors on the 'yearly' sales prices/revenues of those companies and production costs they incurred. Some of these significant factors include production quantities, economic trends (both on micro and macro levels), geopolitical trends, market behavior, productivity/labour behavior etc.".

CHAPTER SIX

COMMODITY SECTOR CASE STUDIES: SELECTION CRITERIA AND JUSTIFICATION FOR THE SELECTION OF THE SECTORS.

6.1 INTRODUCTION

It has been established from previous chapters and other literature that SA is blessed with different mineral resources, which are also available in significant quantities. The country has greatly benefited from her vast mineral resources in many different ways (- revenue-generation, job creation etc.) over time. As a sovereign right of the State and her citizens, SA has continually sought to ensure that the revenue benefits from her minerals through her taxation regime(s) are maximized as much as possible. The institution of the MPRRA in SA has already increased the mineral sector's contribution to the fiscus in terms of compensating the State for exploiting her resources in line with one of the Act's intended goals (as highlighted in Chapter one). However, as overtly stated in previous chapters, this policy instrument was also instituted to facilitate the realization of an additional benefit – optimal use of SA's raw minerals to contribute to the State becoming more industrialized. Hitherto, it is needful to assess whether the 'entire' mineral sector in SA would deliver on the Act's intended beneficiation objectives. To fit the scope of this study, such mineral sector-wide study would have to be streamlined to a certain number of commodity sectors that are suitably representative of the entire industry.

In the previous chapter, the Act's design parameters as well as its modus operandi, were discussed as well as some of its identified revenue-collection and beneficiation provisions concerns and proposed amendments. In addition, the methodologies employed in this study to assess whether the beneficiation objective of the SA's new royalty regime will be achieved was established in that chapter. However, before the methodologies can be applied, it is important to identify the commodity sectors (that were mentioned in the previous chapter) from which data was obtained for application of the methodologies thereof.

Hence, this chapter consists of the identification of the commodity sectors chosen as suitable case studies for the assessment of whether the MPRRA's beneficiation provisions can sufficiently motivate miners to become refiners. The selection criteria used to choose these sectors as well as justification for their selection are discussed in the subsequent sections.

6.2 THE SELECTION CRITERIA AND JUSTIFICATION FOR CHOSING COMMODITY SECTORS.

6.2.1 Selection Criteria

Due to research scope's constraints, it was necessary to select a number of commodity sectors as suitable proxies for the 'entire' minerals industry of SA. This scope was an extended version of Oshokoya's 2012 study, where only one sector – PGM sector, was used as a proxy for the entire industry. The different factors used as selection criteria are as follows:

1. Inclusion of the mineral sub-sector amongst strategic minerals identified by SA government;
2. The possibility of the commodity to exist in dual conditions/stages of refinement/processing;
3. Significance of the mineral sub-sector's contribution to the economy (fiscus);
4. Availability of financial data of different sectors on public domain for the years of assessment (2007 – 2015).

Based on these criteria, the commodities selected for this research's analysis are gold, PGMs, steel_ iron ore and coal. The next section provides justification in detail for why these sectors were settled for as suitable proxies.

6.2.2 Justification for selecting the commodity sectors.

As mentioned in Chapter four, ten strategic mineral commodities were selected for obtaining increased quantities of beneficiated products as part of SA's Beneficiation strategy's action plan. Furthermore, the strategy prioritised five value chains based on these ten strategic minerals as pilot projects that are key to the attainment of its beneficiation objectives. These five value chains include:

1. Energy commodities;
2. Iron and steel;
3. Pigment and titanium metal production;
4. Autocatalytic converters and diesel particulate; and
5. Jewellery fabrication (Adam, 2012).

With the immediate priority for the implementation of the action plan focusing on the first two value chains - energy commodities, iron ore and steel, this informed the selection of coal and iron ore commodities as case studies in this research. With PGM and gold commodities falling within the fourth and fifth value chains, this informed their selection as being necessary for this research.

The dual formulae specifications of the Act applicable to either refined or unrefined minerals, informed the need to select minerals that have products that can be classified according to either of these stages of mineral processing. Except for gold, which is classified by the Act as a Schedule 1 mineral, PGM is termed a dual schedule material. Although coal and iron ore are classified as unrefined mineral resources according to the specifications of the Schedules of the MPRRA, for the purpose of this research, their 'refined' conditions are stipulated as synthetic fuels (coal-to-liquid state (synfuels)) and steel, respectively.

In terms of selecting commodities based on the significance of their contribution to SA's economy, a partly qualitative and partly quantitative approach (semi-quantitative approach), was used. In this semi-quantitative approach, the share of the commodity sector's revenue in total SA mining revenue and their share of total mining exports in SA (in terms of numerical values), were the selection criteria. Although, no ranking system was used to arrive at the commodity sectors that were finally selected, the 'visual' observation of the quantity/magnitude of each commodity sector's share was the major method employed by this semi-quantitative approach. Information to facilitate this selection criteria were obtained from the survey on the mining industry carried out by PwC in 2016 as well as SA's Chamber of Mines (CoM) report on the facts and figures of mining in SA (PwC, 2016b and Chamber of Mines, 2017). It is important to note that the reason why 2015/2016 statistical information was used for these selection criteria as opposed to more recent data of 2016/2017 or 2017/2018 was highlighted briefly in both Chapters one and five.

PwC's survey (conducted yearly) indicated that the mining industry still makes significant contribution to the fiscus. The figures 6.1 and 6.2 show the commodities that occupied the top positions in terms their share of mining revenue to SA's total mining revenue.

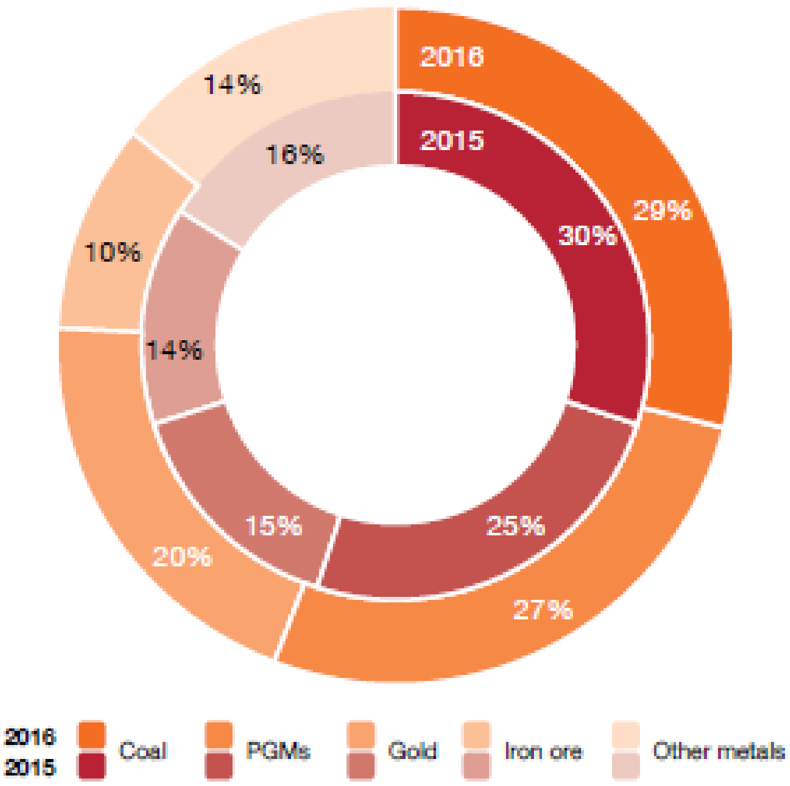

Figure 6.1: Percentage of mining revenue per commodity 2015 and 2016. Source: Stats SA in PwC (2016b).

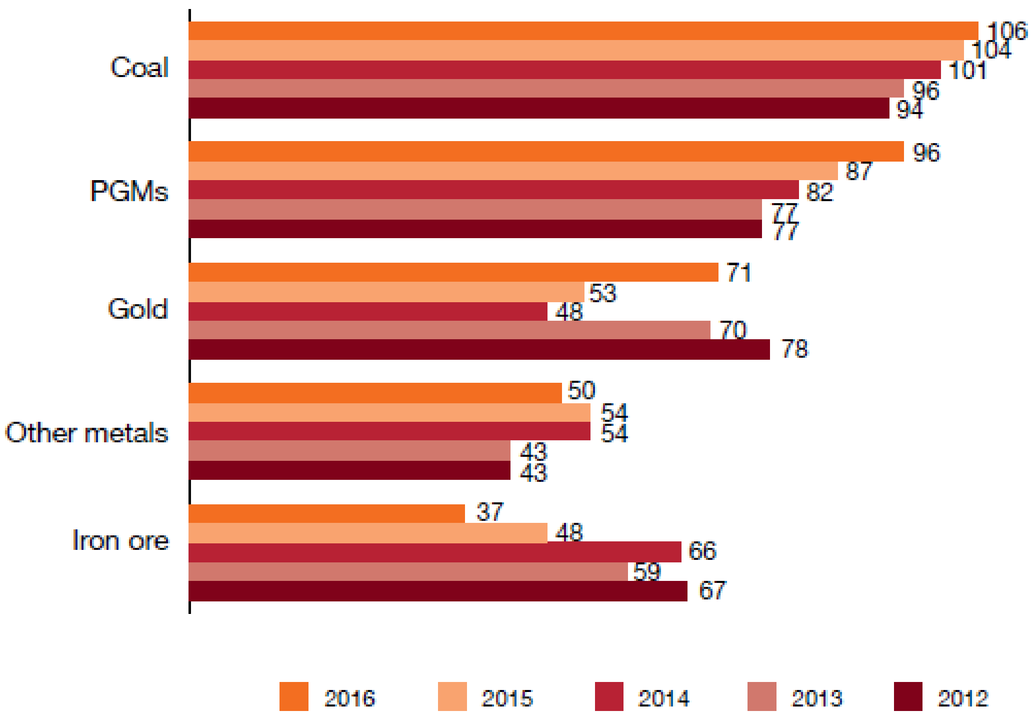

Figure 6.2: Annual revenue per commodity (R 'billions). Source: Stats SA, in PwC analysis (PwC, 2016b).

Coal: - Share of mining revenue decreased from 30% in 2015 to 29% in 2016; and
- Total coal mining revenue increased from R104.4 billion in 2015 to R105.7 billion in 2016.

PGMs: - Share of mining revenue grew from 25% in 2015 to 27% in 2016; and
- Total PGM mining revenue increased from R87 billion in 2015 to R95.6 billion in 2016.

Gold: - Share of mining revenue increased from 15% in 2015 to 20% in 2016; and
- Total gold revenue increased from R54 billion in 2015 to R71.1 billion in 2016.

Iron ore: - Share of mining revenue decreased from 14% in 2015 to 10% in 2016; and
- Total iron ore mining revenue decreased from R48 billion in 2015 to R37 billion in 2016 (PwC, 2016b).

Based on figures 6.1 and 6.2 generated from the analysis carried out by PwC (2016b), the coal sector was the leading South African mining commodity revenue-generator in both 2015 and 2016. The PGM sector occupied second position as commodity revenue-generator, while gold sector was third and iron ore sector was fourth.

In terms of sector's contribution to SA mineral exports, figure 6.3 indicates the sectors that occupied top positions in 2016.

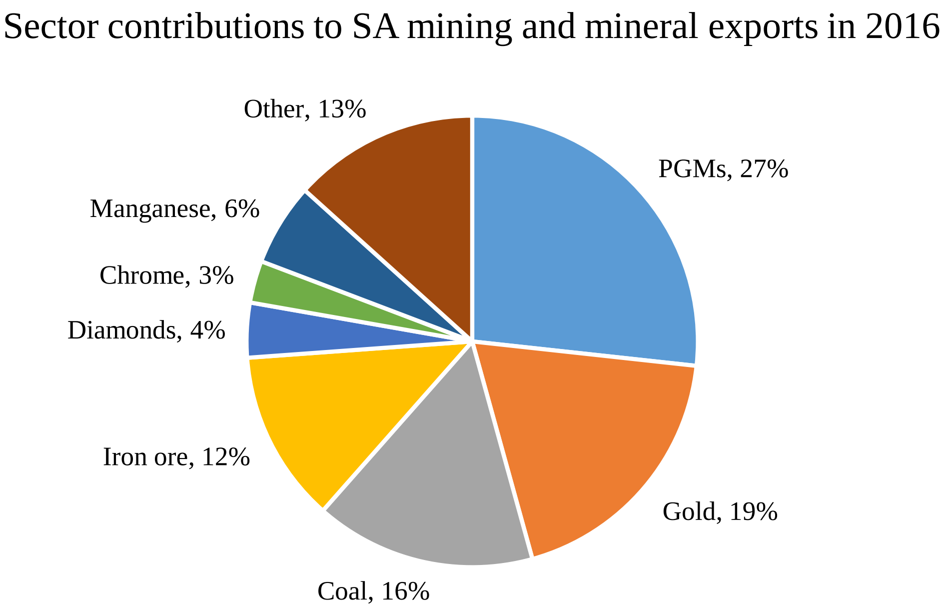

Figure 6.3: Sector contributions to SA mining and mineral exports in 2016. Source: Chamber of Mines and Stats SA (Chamber of Mines, 2017).

From figure 6.3's illustration, the PGM sector occupied the leading position, followed by gold, then coal and iron ore sectors. These information from PwC and CoM further supported the selection of these four commodity sectors. This selection was additionally certified by Stats SA's statement in 2015 that "the four most important minerals to the South African mining industry are coal, gold, platinum group metals (PGMs) and iron ore. Together, the four contribute 80% to total mineral sales" (Stats SA, 2015a).

Furthermore, as part of facilitating the fifth value chain - Jewellery fabrication, the author also considered adding a gemstone commodity – diamond – to the four selected commodities. This was based on the sector's placement as being the next significant mineral contributor to exports after Coal, based on figure 6.3's illustration. With respect to dual levels of processing, rough diamonds are classified as unrefined mineral resources in the Schedule 2 of the Act. Although there is no mention of the beneficiated state of diamonds in Schedule 1 of the Act, for the purpose of this research, its 'refined' condition – polished diamonds or diamond jewellery would have been considered. However, this intended consideration was foiled due to the following limitations:

1. The major diamond mining players in South Africa (De Beers, Petra Diamonds etc.) mainly produce rough diamonds only, which they sell to jewellery manufacturers. However, De Beers group of companies slightly differed from these 'pack' of diamond mining players with its possession of 'sales, marketing and downstream businesses' unit in addition to its mining unit. The "De Beers Diamond jewellers" arm, which is part of the group's downstream business unit was discovered to be a diamond retailer, with no mention of it being involved in the process of manufacturing the diamond jewellery. Hence, financial information from any of these SA diamond mining companies would have consisted of those relating to rough diamond mining only.

2. In order to obtain financial information on the beneficiated state of diamonds, further search for diamond jewellery producers/manufacturers in SA was carried out. The result of the search indicated that this industry was made of small independent manufacturers like Daneel Diamond manufacturers. Attempt to obtain the annual reports of such producers as at the time of study proved abortive.

As mentioned in Chapter five, the confidentiality issues hampered the ability for either the Department of Mineral Resources, SARS and mining companies to release requisite data needed for the assessment employed in this research, just like Oshokoya's 2012 study experience. Hence, requisite financial data had to be populated from information available on public domain. These included annual reports, industry news, analyst books, statistics reports, press statements, other official presentations and/or reports made available on public domain by different stakeholders. In light of this limitation, these publicly reported information were more readily available for companies/producers operating in these four mineral sectors as compared to other mineral sectors.

The next section would give an overview of each of the commodity sectors. It would also provide details as to which companies were specifically selected from players in each of the four commodity sectors as suitable proxies for these sectors in particular.

6.3 OVERVIEW OF EACH OF THE FOUR SELECTED COMMODITY SECTORS

6.3.1 Overview of Gold sub-sector.

All through history, gold has been widely known to be a valuable asset because of various reasons including its high economic value, functionalities and the scarcity of its availability. Mining of gold dates back to about the fourth millennium BC. From that epoch, the popularity of gold's extraction and use gained momentum as it was discovered that the mineral had very malleable and manipulative properties, which could facilitate the creation of aesthetic ornaments/objects (Projects IQ, 2015a). Later down in history, the linkage of gold with wealth became more highlighted from about 2600 BC (Projects IQ, 2015a). At different times in more recent history, the lure of gold's potential ability to generate quick wealth led to gold rushes all over the world. These gold rushes led to the establishment of regions such as California in US, Victoria in Australia and the Transvaal in South Africa etc. (Projects IQ, 2015a).

Currently, gold is still valuably used for various purposes like luxury/fashion, investment portfolios, industrial purposes etc. In times of global economic uncertainty, it is considered as a 'storer' of value and therefore, has always represented an attractive means of investment security.

The unsustainability of most gold rushes that led to many gold mining towns all of over the world becoming abandoned towns paved the way for the formalisation and regulation of the gold mining sector in South Africa (Projects IQ, 2015a). The discovery of gold in SA dates back to the late 19th century and resulted in the development of numerous towns and cities in SA. These towns/cities include the city of Johannesburg, Egoli, or the city of gold, Barberto, and Pilgrim's Rest etc. (Chamber of Mines (A), n.d.).

SA's Witwatersrand Basin holds the world's largest gold reef deposit and it is estimated that more than 50% of all gold reserves globally are found in South Africa (Projects IQ, 2015a). This significant abundance of gold deposits in SA, positioned the country as the world's primary gold producer for many years. As at 1975, gold mining in South Africa had produced 40% of gold ever mined (Projects IQ, 2015a). To date, the Wits Basin has produced more than 2 billion ounces of gold (Chamber of Mines (A), n.d.).

SA's gold sector was not only a global leader but also a major local contributor to SA's economy in terms of contribution to GDP, employment, exports etc. for many years. However, "the glory days of the gold sector started waning in the early 21st century, as mines went deeper to find the rich reef patches and at the same time, the gold price dropped significantly from the previous highs" (Chamber of Mines (A), n.d.). The decline in technical and economic performance of the gold sector globally was made even direr by the global financial crisis that hit the world in 2008. These declining global and internal pressures adversely affected the position of SA in the global stage of gold mining/production. By 2009, China had risen as the world's largest gold producer followed by Australia, then South Africa (Projects IQ, 2015a).

Even though the effects of the crisis have eased off in many countries, the effects on the South African mining industry have been profound and enduring (Projects IQ, 2015a). The decline in performance and economic contribution of SA's gold sector and mining industry in general have been worsened by the combined effects of the internal pressures (of the country and mining industry in particular), rising costs, labour demands, the slow-down in the Chinese economy in 2013/2014 etc. (Chamber of Mines (A), n.d.). This decline was evident as SA's contribution to newly-mined global gold supply dropped to about 5.3%, as at 2013. Additionally, at the gold prices of recent years, it has been estimated that about half of the gold industry is not profitable or classified as marginal (Chamber of Mines (A), n.d.).

Gold mining is typically carried out through methods such as panning, sluicing, dredging, hard rock mining, and by-product mining. However, the most effective gold mining method used in South Africa, is hard rock mining, "since reserves are typically fully encased in rock deep underground…..This method is accompanied by chemical beneficiation, where chemicals, such as cyanide, or activated carbon are added to rough ore and processed – sometimes with heat, water, agitation, electro-winning etc." (Projects IQ, 2015a). These modern beneficiation methods of gold are said to have capabilities of producing gold to 99.9999% purity, as expected by the government through the Act.

Despite the fact that the SA's gold mining industry's production and sales[222] levels as well as contribution to mining GDP have reduced significantly over the past decade, it continues to be a major contributor to the economy and the establishment of the nation's infrastructure (Projects IQ, 2015a). As at year 2014/2015, its contribution to South African mineral export income remained significant at about 17% (Chamber of Mines, 2015). In terms of contribution to government revenues, the gold sector is still a significant contributor as its producers paid about R1.6 billion in taxes in 2014 (Chamber of Mines (A), n.d.). Furthermore, despite employment in the gold sector declining over the years, it currently employs a significant number of people of about 104, 369 people (Stats SA, 2015b). The opening of new gold mines/projects of significant monetary value and in terms of life-of-mine (LoM) in recent times in SA indicates that gold mining in the country is still a viable and lucrative industry (Projects IQ, 2015a).

6.3.2 Overview of PGMs sub-sector.

Platinum group metals (PGMs), which are essential and precious metals consist of six metals. These include platinum, palladium, rhodium, iridium, osmium, and ruthenium, all of which occur together in PGM-bearing ore and are silvery-white in appearance (Chamber of Mines (B), n.d.). The first known application and mining of platinum dates back to 700BC in Ancient Egypt, where the metal was used in the Casket of Thebes (a little box decorated with hieroglyphics in gold, silver and an alloy of PGMs) and for writing inlays on little statuettes (Chamber of Mines (B), n.d.); Projects IQ, 2015b). Much later in history, platinum mining was introduced to western civilisation after Spanish conquerors in South America came across the

[222] Since 2012, mineral sales have fallen 40%.

metal while they were panning for gold in the 17th century. They termed the mysterious grey-white metal "platina," meaning little silver and considered it as a waste product from gold mining (Projects IQ, 2015b). Major breakthroughs in the production and use of PGMs (platinum in particular) emerged from the 18th century in Europe, when more properties[223] of the metal were discovered on combination with other agents like arsenic and oxygen (Chamber of Mines (B), n.d.). Further down the timeline, advances in scientific and technological processes that resulted in more breakthroughs with respect to the refining of platinum, were followed by the discovery of palladium and rhodium (Chamber of Mines (B), n.d.). After World War II, PGM production grew continuously in response to new applications being developed for the metals.

From the 18th century till date, PGMs have been known for their durability and other extraordinary properties - purity, high melting points, oxidation and reduction as well as unique catalytic properties. They have also been known to be extremely resistant to corrosion. These properties have enabled them to be usable in several luxury and fashion purposes, industrial processes, technologies and commercial applications. They are also used as alloying agents for various metal products including fine wires, production of white gold, non-corrosive laboratory containers, jewellery[224], manufacturing of anti-cancer drugs, cardiac treatment, implants, medical instruments, dental equipment, electrical contacts, and thermocouples (Precious Metal Investment.com, 2006). Other consumer and industrial products made with platinum and other PGMs include flat panel monitors, glass fibre, computer hard drives, mobile phones, nylon and razors, among others. In the automotive sector today, the powerful catalytic properties of PGMs play a critical role in autocatalysis[225] and pollution control, as they are used to transform harmful gases (such as carbon monoxide) into less harmful carbon dioxide and water vapour (Projects IQ, 2015b). As stated by Platinum Group Metals, (2017), "their unique chemical and physical properties make PGMs indispensable raw materials and ingredients for manufacturing processes".

They are equally considered as attractive investment vehicles because of the speculative profit opportunities they afford (Gold Trends Bullion Exchange, 2009). Just like gold, they are also

223 "The catalytic properties of platinum became apparent for the first time, and the first fuel cell was devised in 1842 using platinum electrodes." (Chamber of Mines (B), n.d.).

224 The durability, quality, aesthetic appeal, prestige and value of silvery-white platinum and palladium has for centuries contributed to its appeal in jewelry manufacture (Chamber of Mines (B), n.d.).

225 In 2013, auto catalysts accounted for 34% of gross world demand for platinum, palladium and rhodium combined (Chamber of Mines (B), n.d.).

considered as 'storers' of value that represent attractive means of investment security, in times of global economic uncertainty. Based on these various and increasingly important uses of PGMs, the demand for each of the PGMs has been ever-increasing and varied widely, leading to a case where the modern demand for platinum mining in South Africa outstripped the supply in recent past (Projects IQ, 2015b).

South Africa's Bushveld Igneous Complex (BIC) hosts about 80% of the world's PGM-bearing ore/reserves and the discovery of these resources dates back to about the 19th century (Projects IQ, 2015b). Additionally, follow-up work by the geologist Hans Merensky in 1924 and 1925 resulted in major discoveries of PGM deposits in the Bushveld Complex. Merensky's work resulted in the naming of the Merensky reef[226] (Chamber of Mines (B), n.d.). For many years, the bulk of global PGMs have been mined in Southern Africa, with the mines on SA's BIC having been estimated to have produced more than 75% of the world's PGM output (Platinum Group Metals, 2017). As at now, platinum mining in South Africa in conjunction with Russia, produces a total of 90% of the world's platinum demand – which is about 130 tonnes per year (6% of gold production per annum) (Projects IQ, 2015b). China accounts for about 50% of the world's platinum jewellery offtake (Chamber of Mines (B), n.d.).

Mining of PGMs in South Africa is carried out through conventional underground or open-pit operations. The production and beneficiation of PGMs occurs in various stages – beginning with the underground extraction of platinum-rich ore, grinding into workable chunk sizes, gravity-based separation, flotation[227] concentration, smelting and refining. Although the ore grade for PGM mineralization is similar to gold, its processing is more analogous to base metals (Mudd and Glaister, 2009).

In the mining stage, a grinding and milling process results in a liquid mix from which a concentrate is extracted, dried through the flotation concentration stage, smelted[228] into PGM-rich matte as well as separated from other by-products. The final refining stage uses standard electrolyte techniques followed by separation and purification to produce refined PGMs

[226] "The Merensky Reef, stretching from southern Zimbabwe through to the Rustenburg and Pretoria regions, is the centre of platinum mining in South Africa, playing host to companies like Rustenburg Platinum Mines and Bafokeng Rasimone Platinum Mines" (Projects IQ, 2015b).

[227] "The froth flotation method is used to extract the metal by mixing these particles with reagents, and having air pumped through the material. Platinum-containing particles float to the top" (Projects IQ, 2015b).

[228] The skimmed-off material is smelted at temperatures exceeding 1500° C, which enables the separation of the platinum metal from waste (Projects IQ, 2015b).

(Stillwater Palladium, 2008). Platinum refining can take up to six months. It is should be noted that because PGMs are highly recyclable, they are used, rather than consumed (Chamber of Mines (B), n.d.). The ability to recycle PGMs therefore has an impact on it primary production.

The upswing in PGM demand and prices from 2002 through to 2008, before a global economic depression signalled the glory days of the PGM sector. These price increases enabled the SA PGM sector to contribute significantly to SA's fiscus. However, the declining performance of PGM prices coupled with various economic pressures both locally and internationally after 2008, have caused the SA PGM sector's contribution to the fiscus to also follow a declining trend. Nevertheless, the PGM group was the main contributor to SA's mining production in 2015, where it showed a production increase of about 3.5% in overall mining production (Stats SA, 2015a). In terms of employment, the PGM sector has also been a significant contributor. As at 2015, the sector employed 198,952 people, which was a significant increase from 168,530 employees in 2006 (Stats SA, 2015b).

6.3.3 Overview of Steel_ Iron ore sub-sector.

Iron in its elemental form (Fe ore) is the major constituent of the earth's core and ranked as the fourth most abundant element after oxygen, silicon and aluminium in the earth's crust (Department of State development, 2014; Commonwealth of Austarlia, 2015). It is also a widely distributed metal. Iron ore rarely occurs in nature as the native metal – iron. Hence, with iron accounting for almost 95% of all metals used by modern civilisation, iron ore serves as an indispensable commodity (Department of State development, 2014). Iron ores have been primarily mined for the production of almost every iron object that is being used today. Most of the iron produced is then used to make steel. Steel is used to make every day materials such as paper clips, automobiles, locomotives, ships, steel beams used in buildings, furniture, tools, reinforcing rods for concrete, bicycles, medicine, cosmetics, engineering, construction, paint and a whole range of products/items needed for modern life (Geology.com, 2017).

Earth's most important iron ore deposits are found in sedimentary rocks formed over 1.8 billion years ago. These iron ore deposits were formed after the iron contained in Earth's oceans began combining with the oxygen into the waters by the first organisms capable of photosynthesis (Geology.com, 2017). The two most important minerals in these deposits that resulted from the oxidation process are iron oxides: hematite (Fe_2O_3) and magnetite (Fe_3O_4) (Geology.com, 2017). The major iron ore rock types mined from which metallic iron can be produced are hematite, pisolitic goethite/limonite, which provide a 'high-grade' ore, and banded metasedimentary ironstone, magnetite-rich metasomatite, which provide a 'low-grade' ore (Department of State development, 2014).

It was discovered that man has been skilled in the use of iron ore for more than over 3,000 years. Its usage only became well-known from the 14th century, “when smelting furnaces (the forerunner of blast furnaces) began to replace forges” (Commonwealth of Austarlia, 2015). In South Africa, evidence of iron ore being mined and smelted dates back to pre-historic times. Testament to this was found in the remains of ancient workings[229], primitive furnaces, and accumulations of slag[230] at locations scattered across South Africa with a concentration in the northern Transvaal (Taylor et al, 1988). In more recent history, the establishment of formal iron ore mining in SA can be traced to early 20th century, mainly when the “large deposits of coal as well as of limestone, manganese, and iron ore made it possible to establish the state-owned Iron and Steel Corporation of South Africa (Iscor) in 1928” (Kane-Berman, 2017). Since then, the increase in demand for iron/steel due to population and infrastructure growth of economies has made South Africa to be a significant producer of iron ore, which is the key input for basic iron and steel manufactured products. However, “the manufacturing of these products decreased by 7% in 2015” (Stats SA, 2015a).

In SA, iron ore extraction is carried out through opencast methods. Afterwards, the ore is transported to processing plants where it is crushed, screened and beneficiated[231] - converted into either pig iron or steel for final consumption. To produce metallic iron, iron ore has to be smelted[232] to produce pig iron (Department of State development, 2014). Steel is then processed from the pig iron produced, after impurities such as silicon, phosphorus and sulphur have been removed by oxidation and with a reduction in the carbon content though coking coal (Department of State development, 2014; Geology.com, 2017; World Coal Association, 2017). Other forms of metallic iron - Wrought iron (low carbon) and cast iron (pig iron) – produced from iron ore, are also important in the markets.

229 Early man first worked iron ore in Southern Africa 14, 000 years ago, as indicated by the carbon-14 dating of certain ancient workings, not for smelting to iron but purely for cosmetic purposes (Taylor *et al*, 1988).

230 Slags found at Broederstroom in the Transvaal have been dated as from the 4th century A.D (Taylor *et al*, 1988).

231 “Beneficiation includes concentration as well as other processes that make an ore more usable by improving its physical properties (e.g. pelletizing and sintering). Many of the iron ore mines employ some form of beneficiation to improve the grade and properties of their products” (Commonwealth of Austarlia, 2015).

232 The pure metal is silvery white, very ductile, strongly magnetic and melts at 1528°C (Department of State development, 2014).

With iron ore/iron being the most-used metal by both tonnage and purpose, this informed its great demand from emerging economies such as China and Brazil in very recent past (Geology.com, 2017; Anglo American, 2017). However, with the decline of China's economy resulting in a greater part of Chinese steel being exported to the global market at much cheaper prices than other steel producers, this led to the plummeting of steel US dollar prices. Oversupply plus weak demand for iron ore/steel made the iron ore sector in SA to be the biggest loser in 2015, as iron ore prices also decreased by about 42% (Stats SA, 2015a). Furthermore, according to Stats SA (2015a), "South Africa's iron ore production plunged from 80.8 million tonnes in 2014 to 73 million tonnes in 2015". Irrespective of the poor economic performance of the iron sector, it is still a significant employer of labour in SA – as at 2015, it employed about 24,524 people (Stats SA, 2015b).

6.3.4 Overview of Coal sub-sector.

Coal is an abundant fossil, non-renewable resource left-off from layers of dead plants that lived hundreds of millions of years ago. These dead plants were covered by layers of water and dirt that applied heat and pressure as well as trapped the energy of the dead plants, thereby turning the plant remains into coal (TEEIC, n.d.). Hence, from pre-historic times till date, coal has been a valuable combustible commodity (composed mostly of carbon and hydrocarbons) (TEEIC, n.d.). Currently, it has many other important uses all over the world. Although, it is primary used as a fossil fuel for generating heat and electricity, it is also used for "steel production, cement manufacturing and as a liquid fuel" (World Coal Association, 2017b). As stated by World Coal Association, "coal supplies the world with about 30% of its main energy needs and more than 40% of its electricity" (Kane-Berman, 2017).

Coal's production and use has a very long history that dates back to pre-historic times, where archaeological evidence of coal utilization in Ostrava region by prehistoric man was found (WordPress.com, n.d.; OKD, 2012). However, other early references in recorded history to the use of coal in metalworking was found "on Stones (Lap.16) by Theoprastus (371-287BC), coal extraction in China from around 200BC, and exploitation of most of Britain's coalfields by the Romans in the late 2nd century AD" (WordPress.com, n.d.; OKD, 2012). In more recent history, "the first coal mining experiments and utilization of coal were carried out in England during the 17th century" (OKD, 2012). By the 18th century, the demand for coal as a global fuel became dominant as it provided an alternative source of energy required by the technological advances of the Industrial Revolution, replacing wood as a source of energy. However, regular coal mining only began fully from the 19th century with the development of ironworks and railways (OKD, 2012).

Advent of coal mining in SA generally resulted from the start of diamond and gold mining in the late 19th century. Coal was initially found in Natal in the 1840s, but with no means of transporting it, it was not commercially exploited (Kane-Berman, 2017). However, "the first coal in appreciable tonnages were extracted on the Highveld coal field close to the new Witwatersrand gold mines" for power-generation needed by these gold mines (Chamber of Mines (C), n.d.). These coal tonnages were transported by rail in order to supply the gold mines. Coal eventually developed into an industry of its own, "supplying fuel not only to power stations but also to the railways and a range of other industries", especially "as the country entered a period of industrialization during and following the World war II" (Kane-Berman, 2017; Chamber of Mines (C), n.d.). By the 1980s, South Africa had become one of the world's largest exporters of coal, mainly steam coal for electricity generation (Kane-Berman, 2017).

With coal mining in South Africa being centred on the Highveld, with roughly 60% of the country's deposits located in eMalahleni (Witbank) and surrounding areas, it is estimated that SA's coal resource is about 30 billion tonnes (Chamber of Mines (C), n.d.; Projects IQ, 2015c). Furthermore, it is stated that the country is home to about 3.5% of the world's coal resources, with its coal production representing about 3.3% of the world's annual production (Chamber of Mines (C), n.d.). Also, SA's coal exports are about 6% of global exports, thereby enabling the country to be ranked as 6th in the list of coal-exporting nations. On a national front, coal mining has played a significant role in the country's economy for many years. With the increased use of coal globally and in SA leading to increase in revenue from the sector, this facilitated the Country to establish "an industrial[233] future and technical skills base founded firmly on its principal fossil-fuel resource" (Chamber of Mines (C), n.d.). From the time the state-owned power utility – Eskom was founded till date, the coal sector has been responsible for nearly three quarters of its fuel supply. In terms of the coal sector's current contribution to SA's economy, coal is the feedstock for 91% of SA's electricity and through Sasol, it is also the feedstock for a third of SA's liquid fuels, mainly petrol and diesel (Kane-Berman, 2017).

[233] Coal sector led to major programs of building power stations, particularly on the coal fields of Witbank and Delmas, as well as Sasol's major coal-based synfuels and organic chemicals complex at Secunda (Chamber of Mines (C), n.d.).

Apart from Sasol, coal mines employ about 97,000 people, the third largest employer in the mining sector after gold and platinum group metals (Stats SA, 2015b). Also, the sector's annual earnings is about R20 billion (Chamber of Mines (C), n.d.). According to Stats SA (2015c), "in 2013, coal contributed R51 billion to South Africa's economy, compared with gold's R31 billion".

Coal is a complex resource that exists as different types with varying composition (even within the same deposit). There are generally four different types of coal, each having different energy output levels and uses (TEEIC, n.d.; World Coal Association, 2017b). These include Lignite, Subbituminous coal, Bituminous coal, Anthracite. Bituminous coal can also be classified as two types - Steam coal (also known as thermal coal and mainly used in heating and power generation) and Coking coal (also known as metallurgical coal and mainly used in steel production) (World Coal Association, 2017b). In SA, coal is extracted either using surface-mining techniques or underground mining methods. Underground mining methods used include bord-and-pillar and longwall mining in underground workings, while the surface-mining techniques include opencast and truck-and-shovel operations (Hardman, 1996). Amongst other things, the choice of mining method used is dependent on the depth at which the coal deposits are located. It is important to note that "the percentage share that each method contributes to the total production could differ considerably" (Hardman, 1996). After coal from all viable seams has been removed, it is transported to different end-users – power stations and beneficiation facilities such as crushing plants, wash plants etc.

Apart from Eskom power stations, another most important coal user in SA is the South African fuel company, Sasol, which possesses coal-to-liquids (CTL) plants. Its CTL plants use "the Fischer-Tropsch indirect liquefaction method to convert coal into petrol and diesel fuels, and provides raw materials for the petrochemical industries and other important by-products such as fertilizer" (Anglo American, 2008). According to Projects IQ (2015c), "Sasol produces around 35% of the country's liquid fuel". The other significant domestic users of coal are the steel and cement industries. The Steel industry's metallurgical plants "require coking coal to be prepared in coke ovens to provide metallurgical coke capable of reducing and melting iron ore to liquid iron in blast furnaces" (Anglo American, 2008).

Currently, coal remains equally as important as oil and gas in the modern energy mix, providing about one-third of global daily energy demand[234] and because it is dominantly used for power generation, it provides about 42% of the world's electricity (WordPress.com, n.d.). It is noteworthy that the coal sector is currently facing challenges over and above those confronting mining companies in general, due to the obvious contribution of coal mining and coal burning to the degradation of the landscape, to water, soil, and air pollution, and to "climate change" (Kane-Berman, 2017). However, despite these challenges and the attendant lobbies both in South Africa and globally for coal to be replaced with wind and solar energy, it has been observed that many countries are planning additional coal-fired power stations[235]. Rodrigo Echeverri, a coal analyst, predicted that global demand for coal is expected to rise from its current level of 900 million tonnes to 1.2 billion by 2030 (Kane-Berman, 2017). This implies that coal mining is SA would remain a significant revenue-generator for the SA economy.

From the overview of these commodity sectors, it is apparent that they inherently possess largess revenue-generation capabilities with the interplay of the significance of their uses with favourable supply, demand and price factors. Nonetheless, the outlined rigorous production processes that these sectors involve are also indicative of their significant operating and capital cost requirements. This implies that the size of the resultant income from these sectors dictate the size of the revenue benefits that the country can expect to be extracted from them. The next section details the specific companies chosen per commodity sector, whose financial data were used to facilitate this study's assessment.

6.4 CHOICE OF COMPANIES/MINES PER COMMODITY SECTOR

In the four commodities selected for the econometric analysis of this research, there are several/many large and small-scale companies operating within them. Obtaining and processing production, sales and royalty data for every single one of them in this study would have been almost impossible. Hence, it was decided to select one major industry player in both the mining and refining sub-sectors of each sector, as proxies for the sectors. The companies

234 Glencore, a major multinational mining company and commodity trader, said that "coal remains the prime source to fuel economic growth in Asia" and "the lowest-cost fuel source for industrializing economies" (Kane-Berman, 2017).

235 "A report published in April 2016 by a group hostile to coal-fired energy said that $981 billion was being, or was to be, invested in coal capacity around the world. The Times of London reported in January 2017 that more than 2,400 coal-fired power stations were under construction or being planned (Kane-Berman, 2017).

per sector from which data used were obtained as well as the reasons for their selection are as follows:

Gold sub-sector:

1. Gold Fields Limited (Gold Fields); and
2. Sibanye-Stillwater Limited (previously "Sibanye Gold Limited").

Gold Fields Limited is a major global producer of gold having leading mining operations in Australia, Ghana, Peru and South Africa. Gold Fields Limited emerged from a merger between Gold Fields of South Africa and Gencor in 1998. Gold Fields of South Africa was originally formed in SA in 1887, when it began its gold mining operations (Gold Fields Limited, 2017a). In SA, it currently owns and operates South Deep mine, which is designed to access and exploit one of the largest gold ore bodies in the world (Gold Fields Limited, 2017b). Due to the availability and detailed reporting of the financial results of Gold Fields' operations for the required years of assessment, its annual reports were used to obtain relevant financial information of South Deep mine in particular. South Deep mine is a deep-level gold mine that produces refined gold (policy specifies that all gold produced in SA must be produced at the refined state). Hence, in the econometric models generated, South Deep mine was used to represent 'refiners' in the gold sub-sector.

Sibanye-Stillwater is a South African precious metal mining group that produces gold and the platinum group metals (PGMs). It is a significant global player that owns and operates several high-quality operations and projects in both Southern Africa and the United States (Sibanye_Stillwater, 2017a). Due to the availability and detailed reporting of the financial results of Sibanye Gold's operations for the required years of assessment, its annual reports were used to obtain relevant financial information of its Beatrix mine in particular. Beatrix mine is a shallow-level gold mine that produces refined gold (policy specifies that all gold produced in SA must be at the refined state). However, in one of the econometric models generated, Beatrix mine was <u>assumed</u> to represent 'miners-only' in the gold sector. With Beatrix mine being a lower-cost producer due to its lower depth compared to South Deep mine, this assumption was done only for the purpose of making assessment of the gold sector suitably comparable to the refiner/miner-only classifications of the other commodity sectors that were assessed.

PGM sub-sector:

1. Anglo American Platinum Limited (Amplats); and
2. Aquarius Platinum Limited (Aquarius).

AMPLATS was selected because of its dominant position as one of the top leaders in the mining, marketing, and distribution of the PGMs and other precious minerals in the world. It is estimated that AMPLATS produces about 40% of the world's total platinum group metals (Projects IQ, 2015b). Amplats originated from SA and is a global mining company, which has a significant PGM asset base in the South African Bushveld Igneous Complex. It owns and operates various mines, concentrators, smelters, a Base Metals Refinery and a Precious Metals Refinery in South Africa. Due to the availability and detailed reporting of the financial results of Amplats' operations for the required years of assessment, its annual reports were used to obtain relevant financial information of its Mogalakwena mine in particular. Mogalakwena mine's output is refined PGMs. Hence, in the econometric models generated, it was used to represent 'refiners' in the PGM sub-sector.

Aquarius (now acquired by Sibanye-Stillwater) was a significant PGM producer in SA. It possessed operating assets located on major PGM-bearing orebodies in southern Africa (Aquarius Platinum Limited, 2015). It possessed mechanised, low-cost mines and processing operations in joint venture agreements with companies like Amplats. Its mines produced PGMs-in-concentrate. Based on the JVs, the companies combined their assets for joint exploration of resources and use of infrastructure so that the resulting production and financial outcomes were split on a 50:50 basis (Aquarius Platinum Limited, 2006). The concentrates produced by its mines were sold directly to its customers in terms of off-take agreements for smelting and refining to produce refined PGMs (Aquarius Platinum Limited, 2015). Amplats smelted, refined and marketed its share of the metal in concentrate, which were produced at the two mines in which it had JV Agreements with Aquarius. Due to the availability and detailed reporting of the financial results of Aquarius' operations for the required years of assessment, its annual reports were used to obtain relevant financial information of its Kroondal mine in particular. Kroondal mine's output is unrefined PGMs - concentrates. Hence, in the econometric models generated, it was used to represent 'miners or miners-only' in the PGM sub-sector.

Steel _Iron ore sub-sector:

1. ArcelorMittal South Africa Limited (AMSA); and
2. Anglo American Kumba Iron Ore Limited (Kumba Iron ore).

ArcelorMittal South Africa came about when the state-owned Iron and Steel Corporation of South Africa (Iscor) was privatised. It is part of the ArcelorMittal group, the world's leading steel producer and it is currently the largest steel manufacturing company in the country and in Africa. It has its presence in more than 60 countries. In SA, the company produces flat steel and long steel products (ArcelorMittal South Africa, 2016). It also possesses "coke and chemicals operation, which produce commercial grade coke for use by the ferro-alloy industry, and processes steelmaking by-products" (ArcelorMittal South Africa, 2016). Due to the availability and detailed reporting of the financial results of AMSA's operations for the required years of assessment, its annual reports were used to obtain relevant financial information of flat steel division in particular. AMSA Flat steel division's selection was informed by its position as one of the world's largest and biggest suppliers of flat steel products. Although AMSA's flat steel products are produced at its Vanderbijlpark and Saldanha Works, the annual reports did not provide detailed production and financial information for these branches individually. Hence, in the econometric models generated, the information for the entire flat steel (SA) division was used to represent 'refiners' in the steel_iron ore sub-sector.

Kumba Iron ore belongs to the Anglo American plc group of companies and is a leader in producing high-quality iron ore to the global steel industry. It primarily operates in SA and sells its products both locally and internationally. Due to the availability and detailed reporting of the financial results of Kumba Iron ore's operations for the required years of assessment, its annual reports were used to obtain relevant financial information of Sishen mine in particular. Sishen mine's selection was informed by its position as Kumba Iron ore's flagship operation with the bulk of its iron ore production coming from the mine as well as the mine having one of the largest open pit mines in the world (Anglo American, 2017b). Hence, in the econometric models generated, the information for Sishen mine was used to represent 'miners-only' in the steel_iron ore sub-sector.

Coal sub-sector:

1. Sasol limited; and

2. Anglo American plc Thermal coal SA division (Anglo coal).

The South African Coal, Oil, and Gas Corporation (Sasol) is a multinational corporation, which was first established by the SA government in 1950. It is an integrated energy and chemical company that built the first factory in the world to convert coal feedstock into liquid fuel on a major commercial scale (Kane-Berman, 2017). Due to the availability and detailed reporting of the financial results of Sasol's operations for the required years of assessment, its annual reports were used to obtain relevant financial information of Synfuels (SA) division in particular. Sasol synfuels (SA) business segment's selection was informed by its position as the segment that converts coal into a wide range of liquid fuels intermediates and petrochemicals in SA. Hence, in the econometric models generated, the information for the entire synfuels (SA) segment was used to represent 'refiners' in the coal sub-sector.

Anglo American Thermal Coal is a member of the Anglo America plc group of companies. It is one of the key companies actively involved in coal mining in South Africa (Projects IQ, 2015c). Due to the availability and detailed reporting of the financial results of Anglo American plc's operations for the required years of assessment, its annual reports were used to obtain relevant financial information of Anglo coal division in particular. Hence, in the econometric models generated, the information for the entire Anglo coal (SA) segment was used to represent 'miners-only' in the coal sub-sector, since the annual reports did not provide detailed production and financial information for its individual collieries.

6.5 CONCLUSION

In this chapter, some of the four major commodity sectors that have been and are still very significant contributors to South Africa's wealth all through history, were identified. For the purpose of this study, the justification for the selection of these sectors that comprise of minerals and metals of the future, were expounded. These four commodities were established as the focus of the economic analysis of this project not only because of their significant positions in terms of contribution to government receipts but most importantly, because of the ability of their outputs to exist in dual states of processing - either unrefined or refined (except for gold). Furthermore, the companies/mines per commodity sector found to be suitable proxies for refined and unrefined producers, were highlighted.

The next chapter would consist of using ‘real-time’ financial data of these commodity sectors to ascertain whether in terms of the Act’s provisions, sufficient value (Realized Beneficiation incentive[236]) accrues to the producer that adds-on mineral processing facilities, in comparison to the miners-only. The assessment would be carried out to establish whether such value-add is enough to inspire miners to upgrade to become refiners.

[236] Recall: “It is important to note that the ability of the companies that were assessed to gain ‘Realized Beneficiation Incentive’ or not in all the years of assessment, was not only dependent on the nature of the Royalty regime but largely dependent on the peculiar impact of other factors on the ‘yearly’ sales prices/revenues of those companies and production costs they incurred. Some of these significant factors include production quantities, economic trends (both on micro and macro levels), geopolitical trends, market behavior, productivity/labour behavior etc.”

CHAPTER SEVEN

APPLICATION OF ECONOMETRIC ANALYSIS TO COMMODITY SECTOR CASE STUDIES AND ANALYSIS OF THE RESULTS AND OBSERVATIONS FROM THE CASE STUDIES.

7.1 INTRODUCTION

In the previous chapter, four commodity sectors were identified as being substantial contributors to the South African economy and with the imposition of the MPRRA, their importance to the fiscus and the economy has become even greater. Furthermore, it was highlighted in that chapter that the suitability of the selection of those sectors for the purpose of this research's assessment of MPRRA's refining objectives, was also informed by the fact that their outputs could be classified in dual states of refinement.

After specifying the companies' mines or divisions whose financial data were found to be suitable proxies for refiners and miners-only in the four commodity sectors, this chapter proceeds to apply the methodology of this research to their financial data. This chapter would also consist of the description of the data/information obtained per commodity sector and the assumptions thereof, which were used to facilitate the econometric methods employed in this study.

7.2 DATA USED

As highlighted in chapter six, the major players in each selected commodity sector that possess mining-only operations or both mining and refining operations in SA, were presented as suitable representatives of the dual stages of processing per sector required this study. With the limitations encountered in obtaining detailed financial information from the necessary institutions – government and industry, the data used in this research had to be built up from publicly available information[237]. The sources of these publicly available information were

[237] The resolve to use financial data in public domain was due to the refusal of access to such information by both the DMR and SARS, who were approached between January and March 2017. See details in section 5.4.2 in chapter five of this thesis.

mentioned in chapter five. The companies' capacities to provide quality information is hereby well acknowledged.

7.2.1 General Assumptions

With the different companies having different reporting styles, there were inconsistencies/gaps of information that were identified either between information of companies that needed to be compared with each other or even between years of reporting for the same company(ies). Hence, in order to generate cash flow statements that were consistent for all the companies in all the years of assessment, various realistic assumptions had to be made for many of the key parameters needed in calculating royalty payments. The various assumptions are stated as follows:

- Years of assessment: With this research's analysis aiming at checking the impact of the MPRR regime on historical financial data, the years of assessment that were selected included some years before the Act came into force (2007 to 2009) as well as years after the Act came into force (2010 to 2015). These selected years were strategic because they included data of some of the commodities-boom years before the World's financial crisis of 2008 - 2010 and data of some of the commodities-bust years after the crisis. This was done in order to conduct a fruitful evaluation that would be appropriate for the postulation of future behaviour of the industry. As in Oshokoya's 2012 study, data for 2006 was not used due to the limitation encountered in obtaining some of the companies' detailed 2006 data. Starting with year 2007's data that was 3 years before the Act came into force gave a reasonable 'feel' of how the sectors would have performed in terms of royalty payments. From year 2008 (the year in which the global financial crisis occurred), gave a reasonable 'feel' of the conservative position that the mining sector has been under, as commodity prices have been generally under pressure. The yield from this conservative position is expected to facilitate the conversation of how the policies (MPRRA etc.) can incentivise the cost-side of the mining sector.
- Production profile/parameters: It was observed that not all the companies per sector reported detailed values for production parameters per year. Some reported production volumes and sales volumes in some years and not in other years; some reported production conversion parameters (grade, yield, exchange rates, prices etc.) needed for

calculation of revenues received from the stated production/sales volumes, whilst others did not. Hence, in those peculiar cases, the revenues (with no calculations) stated in the reports were used for royalty payment calculations.

- Prices: In company reports that stated prices, it was observed that the reporting of these prices were not always consistent between the different years. Therefore, some unreported commodity prices had to be generated based on information gathered from industry news or press statements and/or percentage increase-decrease calculations. For the realisation of reasonable prices, calculations took into consideration issues such as Rand-US Dollars exchange rate performance, supply-demand factors, other prevailing market conditions and statements such as "…prices continue to perform well below prices seen prior to the 2008 financial crisis….." and "…the commodities slump of the past few years and the glut of bulk commodities on international markets has resulted in export prices (for coal, steel, iron ore etc.) falling by more than half since 2013 as exporters from competing countries struggled to maintain their market shares" (PwC, 2016a; Chamber of Mines (C), n.d.).

- Operating costs: As with commodity prices, it was observed that in some company reports, the reporting of production/operating costs were not always detailed per mine/division and/or inconsistent between the different years. In some cases, these costs were not reported at all. Therefore, some unreported production/operating costs had to be generated based on information gathered from press statements and/or ratio or percentage increase-decrease calculations. Additionally, unlike the PGM sector proxy that was used in Oshokoya's 2012 study, which specified on-mine costs as separate from smelting and refining costs (processing costs), it was observed that many of the companies in the selected commodity sectors of this research did not give such cost specifications. This hampered the assessment of checking what value was added based on the proportion of refinement costs as a percentage of sales price received for refined products, as per Bradley (1986) and Cawood (2011)'s analysis. Hence, that assessment was not included in this study.

- Capital costs (capex): Capital expenditure was included in this assessment. This was informed by the Act's definition of EBIT as "gross sales after adding recoupments under the Income Tax Act (ITA) minus capital expenditure minus operating expenditure", and Cawood (2010)'s observation - "EBIT closely resembles net profit and/or profit before tax definitions….inclusions into capital for purpose of the royalty calculation are the usual 100% mining capital expensing rule….”. This was carried out in order to have the allowable policy incentive of reducing the royalty amount payable. However, in calculating EBIT for this analysis, since initial project capital[238] (which could have been redeemed per mine/business division already) not being accessible as at time of analysis, on-going capex per year was used. In the reporting of on-going capex, it was observed that there were inconsistencies between the companies; some reported such capex per year and per mine/division, while others did not. In cases where on-going capex were not stated, the reported depreciation (and amortisation, where there were not clear separations) amounts were used in place of the yearly capex.

- As per specification of the Act, the values for revenue and costs were calculated (as much as was possible) to be as closely attributable to the production of mineral products. This implies that to a significant extent, other incomes received by the mines/business segments were not taken into consideration in this analysis.

- Another general assumption is that the analysis carried out in this research supposes that with all things being equal, a miner can decide on becoming a refiner or not, with reference to the results and findings of this research just like the case of Oshokoya’s 2012 study. It also assumed that that the miner would make such decision if the global economic factors and market dynamics remain the same as in the years used for the assessment in this research.

7.3 RESULTS AND DISCUSSIONS FOR EACH COMMODITY SECTOR CASE STUDY

In this section, the results of the assessments carried out using the econometric methodologies stated in chapter five, are presented. As mentioned previously, it was important to determine whether the observation of the royalty payments made by the refiners and miners-only in each commodity sector was statistically significant. The test of statistical significance and Realized

[238] It is acknowledged that not taking initial capex but only on-going opex into consideration can significantly impact the results of this study. However, due to the age of the mines used for this analysis as well as the limitation encountered in accessing requisite financial information, the assumption was that initial capex had already been redeemed or currently being redeemed and added to current costs.

Beneficiation incentive[239,240] assessment were carried out on the current royalty policy option (hereinafter referred to as Model 1). The result from Model 1's assessment gave birth to the generation and testing of other models. The results of Model 1 are presented in the following subsections.

7.3.1 Model 1's assessment: Results

In this model, the two royalty formulae were applied to financial information of the two classes of producers in each commodity sector. None of the parameters in the current formulae were tampered with in their application in this model. However, as the assessment was conducted individually for each of the selected commodity sector, the only peculiar assumption made in this model had to do with the Act's specific classification of all gold produced in SA as refined minerals. The implication thereof of the Act's specification for gold is that only the royalty formula for refined minerals is applicable to the gold sector. Therefore, in the calculations used to populate the analysis for model 1's gold sector, the royalty formula for refined minerals was applied to the Deep-level gold mine (South Deep mine), using the mine as the refiner. The deep-level gold mine received the royalty-formula-for-refined-minerals incentive because of the extra-costs it incurs in mining deeper. On the other hand, the other assumption made was to apply the royalty formula for unrefined minerals to the Shallow-level gold mine (Beatrix mine). These assumptions and calculations were carried out in this manner for the purpose of suitable comparability with the other three commodity sectors, which could be specified in two states/levels of refinement.

For model 1's Gold sector assessment, Tables 7.1 and 7.2 consist of the financial information of the producers that were used to facilitate the assessment.
For model 1's PGM sector assessment, Tables 7.3 and 7.4 consist of the financial information of the producers that were used to facilitate the assessment.
For model 1's Steel_Iron ore sector assessment, Tables 7.5 and 7.6 consist of the financial information of the producers that were used to facilitate the assessment.

239 This represents the monetary value of the MPRRA's beneficiation incentive provision.

240 Recall: "It is important to note that the ability of the companies that were assessed to gain 'Realized Beneficiation Incentive' or not in all the years of assessment, was not only dependent on the nature of the Royalty regime but largely dependent on the peculiar impact of other factors on the 'yearly' sales prices/revenues of those companies and production costs they incurred. Some of these significant factors include production quantities, economic trends (both on micro and macro levels), geopolitical trends, market behavior, productivity/labour behavior etc."

For model 1's Coal sector assessment, Tables 7.7 and 7.8 consist of the financial information of the producers that were used to facilitate the assessment.

Model 1's Gold sector assessment.

Table 7.1: Royalty formula for refined minerals applied to financial information of Gold Fields' South Deep mine.

Production	Year / **Units**	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	1,104,000	1,367,000	1,241,000	1,681,000	2,440,000	2,106,000	2,347,000	1,323,000	1,496,000
Gold produced	kg	5,076	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold sold (G1)	kg	5,166	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold price received (G2)	R/kg	156,899	231,187	259,921	288,022	363,538	438,961	434,915	442,023	478,166
Gross Sales Revenue (G1*G2) = G	R	810,540,234	1,669,170,140	1,412,410,714	2,372,149,192	3,086,800,309	3,692,100,130	4,086,900,014	2,756,900,008	2,945,499,973
Total Operating costs (O)	R	720,000,000	1,263,526,000	1,188,419,000	16,740,422,000	2,138,400,000	2,480,751,000	3,089,280,000	2,656,310,000	3,000,088,000
Operating profit before Royalty + Capex (G – O) = Eo	R	90,540,234	405,644,140	223,991,714	697,727,192	948,400,309	1,211,349,130	997,620,014	100,590,008	-54,588,027
Comment: Tax Shield										
Capex redemption (C)	R	-283,400,000	-784,700,000	-1,020,500,000	-1,613,300,000	-1,982,400,000	-2,575,800,000	-1,943,300,000	-994,360,000	-848,300,000
EBIT before Royalties after Capex (Eo - C) = E	R	-192,859,766	-379,055,860	-796,508,286	-915,572,808	-1,033,999,691	-1,364,450,870	-945,679,986	-893,769,992	-902,888,027
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	0%	0%	0%	0%	0%	0%	0%[241]
Royalty rate = R%	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Royalty paid by refiner (Deep mine) (R% * G) = R	R	4,052,701	8,345,851	7,062,054	118,607,456	15,434,002	18,460,501	20,434,500	13,784,500	14,727,500

[241] It should be noted that the zero-profitability realized in these years of assessment for South Deep mine is due to the relative 'newness' of the mine and its need to satisfy capital expenditure redemption requirements (allowable deduction as a royalty/tax incentive).

Table 7.1: Royalty formula for refined minerals applied to financial information of Gold Fields' South Deep mine (*continued*).

Operating Profit (Eo) less Royalties (R) = E*	R	86,487,533	397,298,289	216,929,660	685,866,446	932,966,307	1,192,888,629	977,185,514	86,805,508	-69,315,527

Source: Gold Fields Limited (2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

Table 7.2: Royalty formula for unrefined minerals applied to financial information of Sibanye Gold's Beatrix mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes milled (T)	t	3,590,000	3,215,000	29,910,000	3,051,000	3,817,000	3,368,000	4,091,000	4,546,000	4,319,000
Gold produced and sold (G1)	kg	16,903	13,625	12,164	12,188	10,787	8,981	9,722	10,354	10,105
Gold price received (G2)	R/kg	157,249	231,750	259,126	287,187	371,772	435,698	433,460	441,018	476,546
Gross Sales Revenue (G1*G2) = G	R	2,657,979,847	3,157,593,750	3,152,008,664	3,500,235,156	4,010,304,564	3,913,003,738	4,214,098,120	4,566,300,372	4,815,497,330
Operating Costs:										
Unit Operating costs (O1)	R/t	432	536	681	745	631	783	732	705	785
Total Operating costs (O1*T) = O	R	1,550,880,000	1,723,240,000	2,036,871,000	2,272,995,000	2,408,527,000	2,637,144,000	2,994,612,000	3,204,930,000	3,390,415,000
Operating profit before Royalty + Capex (G – O) = Eo	R	1,107,099,847	1,434,353,750	1,115,137,664	1,227,240,156	1,601,777,564	1,275,859,738	1,219,486,120	1,361,370,372	1,425,082,330
Comment: Tax Shield										
Capex redemption (C)	R	-592,800,000	-576,600,000	-629,400,000	-650,600,000	-611,100,000	-658,200,000	-537,000,000	-548,000,000	-596,500,000
EBIT before Royalties after Capex (Eo - C) = E	R	514,299,847	857,753,750	485,737,664	576,640,156	990,677,564	617,659,738	682,486,120	813,370,372	828,582,330
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	19%	27%	15%	16%	25%	16%	16%	18%	17%
Royalty rate = R%	%	2.7%	3.5%	2.2%	2.3%	3.2%	2.3%	2.3%	2.5%	2.4%

Table 7.2: Royalty formula for unrefined minerals applied to financial information of Sibanye Gold's Beatrix mine (*continued*).

Royalty paid by miner-only (shallow mine) (R% * G) = R	R	70,434,327	111,093,941	69,730,895	81,572,304	130,126,808	88,193,879	96,902,282	113,205,988	116,142,190
Operating Profit (Eo) less Royalties (R) = E*	R	1,036,665,520	1,323,259,809	1,045,406,769	1,145,667,852	1,471,650,756	1,187,665,860	1,122,583,838	1,248,164,384	1,308,940,140

Source: Gold Fields Limited (2008, 2009, 2010 and 2011); SibanyeGold (2012, 2013a, 2014a and 2015a); SibanyeGold (2013b, 2014b and 2015b).

Model 1’s PGM sector assessment.

Table 7.3: Royalty formula for refined minerals applied to financial information of Amplats’ Mogalakwena mine.

	Units \ Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes milled (T)	t	4,187,000	7,180,000	9,722,000	10,380,000	10,835,000	10,480,000	11,031,000	11,731,000	11,725,000
Pt produced	oz	162,500	177,400	233,300	272,300	312,800	304,800	342,800	375,400	392,500
Gross Sales Revenue (G)	R	3,421,000,000	3,755,000,000	4,540,000,000	6,187,000,000	8,403,000,000	7,649,000,000	10,086,000,000	13,779,000,000	13,864,000,000
Operating Costs:										
Unit on-mine cost/tonnes milled (Om1)	R/t	282	288	196	231	254	315	360	437	409
On-mine costs (mining+concentration) = Om1*T = Oc	R	1,180,734,000	2,067,840,000	1,905,512,000	2,397,780,000	2,752,090,000	3,301,200,000	3,971,160,000	5,126,447,000	4,795,525,000
Processing (smelting, treatment and refining) costs (Pc)	R	345,953,500	604,513,600	872,857,700	837,144,000	1,149,151,600	1,341,208,800	1,481,416,800	1,968,613,000	2,074,010,000
Total op. costs (Oc+Pc) = O	R	1,526,687,500	2,672,353,600	2,778,369,700	3,234,924,000	3,901,241,600	4,642,408,800	5,452,576,800	7,095,060,000	6,869,535,000
Operating profit before Royalty + Capex (G – O) = Eo	R	1,894,312,500	1,082,646,400	1,761,630,300	2,952,076,000	4,501,758,400	3,006,591,200	4,633,423,200	6,683,940,000	6,994,465,000
Comment: Tax shield										
Capex redemption (C)	R	-4,143,000,000	-2,964,000,000	-1,246,000,000	-1,350,000,000	-1,251,000,000	-1,171,000,000	-1,960,000,000	-2,144,000,000	-1,939,000,000
EBIT before Royalties after Capex (Eo - C) = E	R	-2,248,687,500	-1,881,353,600	515,630,300	1,602,076,000	3,250,758,400	1,835,591,200	2,673,423,200	4,539,940,000	5,055,465,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	11%	26%	39%	24%	27%	33%	36%
Royalty rate = R%	%	0.5%	0.5%	1.4%	2.6%	3.6%	2.4%	2.6%	3.1%	3.4%
Royalty paid by refiner (R% * G) = R	R	17,105,000	18,775,000	63,950,424	159,101,080	302,075,672	185,092,296	264,303,856	432,090,200	473,757,200

Table 7.3: Royalty formula for refined minerals applied to financial information of Amplats' Mogalakwena mine (*continued*).

Operating Profit (Eo) less Royalties (R) = E*	R	1,877,207,500	1,063,871,400	1,697,679,876	2,792,974,920	4,199,682,728	2,821,498,904	4,369,119,344	6,251,849,800	6,520,707,800

Source: Anglo Platinum Limited (2008 and 2009); Anglo American Platinum Limited (2012, 2013, 2014 and 2015).

Table 7.4: Royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine.

	Year / units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production Volume (V)	oz	439,350	391,000	422,078	408,570	414,946	334,850	406,497	430,743	442,477
Price Received (P)	$/oz	1,386	1,887	1,044	1,227	1,454	1,322	1,243	1,180	1,099
Exchange rate (Ex)	R/$	7.2	7.2	9.0	7.6	7.0	7.8	8.8	10.4	11.4
Gross Sales revenue (V*P*Ex) = G	R	4,372,182,738	5,334,416,910	3,979,064,371	3,799,970,656	4,241,420,333	3,443,985,826	4,446,426,785	5,270,829,794	5,553,342,987
Operating Costs:										
Unit operating costs (O1)	R/oz	3,069	4,241	5,174	5,769	6,273	8,748	8,343	9,115	9,168
Total Operating costs (O1*V) = O	R	1,348,365,150	1,658,231,000	2,183,831,572	2,357,040,330	2,602,956,258	2,929,267,800	3,391,404,471	3,926,222,445	4,056,629,136
Op. profit before Royalty+Capex (G – O) = Eo	R	3,023,817,588	3,676,185,910	1,795,232,799	1,442,930,326	1,638,464,075	514,718,026	1,055,022,314	1,344,607,349	1,496,713,851
Comment: Tax shield										
Capex	$	35,000,000	48,000,000	31,000,000	26,000,000	50,000,000	64,000,000	45,499,000	38,946,000	35,959,000
Capex redemption (C)	R	- 250,000,000	- 347,000,000	- 281,000,000	- 197,080,000	- 349,000,000	- 495,916,000	- 400,440,000	-404,002,000	- 410,524,000
EBIT before Royalties after Capex (Eo - C) = E	R	2,773,817,588	3,329,185,910	1,514,232,799	1,245,850,326	1,289,464,075	18,802,026	654,582,314	940,605,349	1,086,189,851
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	63%	62%	38%	33%	30%	1%	15%	18%	20%

Table 7.4: Royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine (*continued*).

Royalty rate = R%	%	7%	7%	4.7%	4.1%	3.9%	0.6%	2.1%	2.5%	2.7%
Royalty paid by miner-only (R% * G) = R	R	306,052,792	373,409,184	188,143,411	157,427,667	164,480,888	19,309,043	94,963,502	130,865,855	148,454,476
Operating Profit (Eo) less Royalties (R) = E*	R	2,717,764,796	3,302,776,726	1,607,089,388	1,285,502,659	1,473,983,187	495,408,983	960,058,812	1,213,741,494	1,348,259,375

Source: Aquarius Platinum Limited (2007, 2010, 2011 and 2015)

Model 1's Steel_Iron ore sector assessment.

Table 7.5: Royalty formula for refined minerals applied to financial information of AMSA's Flat steel division.

	Year units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume (T)	t	4,231,000	4,084,000	3,428,000	3,814,000	4,060,000	3,554,000	3,229,000	3,586,000	3,145,000
Sales Volume (V)	t	3,928,000	3,412,000	2,858,000	3,348,000	3,424,000	3,141,000	2,771,000	2,981,000	2,678,000
Assumed prices (P)	$/t	659	906.9	683.4	809.4	891.9	828.2	782.1	738	597.5
Average exchange rate (Ex)	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	10.8	12.8
Gross Sales revenue (V*P*Ex) = G	R	18,275,177,120	25,557,862,372	16,484,164,338	19,889,717,378	22,171,810,003	21,356,267,098	20,912,936,512	23,847,761,520	20,417,339,800
Operating Costs:										
Unit production costs (O1)	R/t	2,538	4,032	4,070	4,045	4,823	5,064.2	5,266.7	5,635.4	5,729.2
Total production costs (O1*T) = O	R	10,738,278,000	16,466,688,000	13,951,960,000	15,427,630,000	19,581,380,000	17,997,989,100	17,006,238,880	20,208,508,540	18,018,459,800
Operating profit before Royalty + Capex (G – O) = Eo	R	7,536,899,120	9,091,174,372	2,532,204,338	4,462,087,378	2,590,430,003	3,358,277,998	3,906,697,632	3,639,252,980	2,398,880,000
Comment: Tax Shield										
Capex redemption (C)	R	- 1,443,000,000	- 1,035,000,000	- 630,000,000	- 1,147,000,000	- 717,000,000	- 594,000,000	- 835,000,000	- 501,000,000	- 601,000,000
EBIT before Royalties after Capex (Eo - C) = E	R	6,093,899,120	8,056,174,372	1,902,204,338	3,315,087,378	1,873,430,003	2,764,277,998	3,071,697,632	3,138,252,980	1,797,880,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	33%	32%	12%	17%	8%	13%	15%	13%	9%
Royalty rate = R%	%	3.2%	3%	1.4%	1.8%	1.2%	1.5%	1.7%	1.6%	1.2%
Royalty paid by refiner (R% * G) = R	R	578,887,815	772,283,262	234,597,169	364,655,577	260,733,450	327,923,575	350,300,493	370,299,046	245,917,099
Operating Profit (Eo) less Royalties (R) = E*	R	6,958,011,305	8,318,891,110	2,297,607,169	4,097,431,801	2,329,696,553	3,030,354,422	3,556,397,139	3,268,953,934	215,296,290,100

Source: ArcelorMittal South Africa Limited (2008, 2009, 2010); ArcelorMittal (2011, 2012, 2013, 2014 and 2015); ArcelorMittal South Africa Limited (2014).

Table 7.6: Royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine.

	Year units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume (T)	t	34,000,000	34,000,000	39,400,000	41,300,000	38,900,000	33,700,000	30,900,000	35,500,000	31,400,000
Export sales volume (Ev)	t	24,000,000	24,900,000	34,200,000	36,100,000	37,183,000	31,200,000	27,000,000	27,870,000	27,200,000
Export sales price (Ep)	$/t	54	88	65	124.8	157.3	122	135	97	56
Average exchange rate (Ex)	R/$	7	8.3	8.4	7.3	7.3	8.2	9.6	10.8	12.8
Export Sales Revenue (Ev*Ep*Ex) = Er	R	9,110,880,000	18,077,400,000	18,650,970,000	32,888,544,000	42,390,943,938	31,174,416,000	35,064,900,000	29,277,713,700	19,436,032,000
Domestic sales volume (Dv)	t	6,500,000	5,600,000	4,000,000	5,000,000	5,000,000	3,500,000	3,900,000	3,830,000	3,000,000
Domestic sales price (Dp)	R/t	127	136	204	246.8	462.4	532.4	390.3	397.9	727
Domestic Sales Revenue (Dv*Dp) = Dr	R	825,500,000	761,600,000	816,000,000	1,234,200,000	2,312,050,000	1,863,225,000	1,522,326,000	1,523,803,800	2,181,000,000
Total Gross Sales Revenue (Er + Dr) = G	R	9,936,380,000	18,839,000,000	19,466,970,000	34,122,744,000	44,702,993,938	33,037,641,000	36,587,226,000	30,801,517,500	21,617,032,000
Operating Costs:										
Unit production costs (O1)	R/t	74.3	101.9	98.8	113.7	150.5	197.8	266.9	271.8	310.8
Total Production costs (O1*T) = O	R	2,526,200,000	3,463,240,000	3,893,902,000	4,695,397,000	5,853,283,000	6,664,175,000	8,248,446,000	9,650,320,000	9,759,120,000
Operating profit before Royalty + Capex (G – O) = Eo	R	7,410,180,000	15,375,760,000	15,573,068,000	29,427,347,000	38,849,710,938	26,373,466,000	28,338,780,000	21,151,197,500	11,857,912,000
Comment: Tax shield										
Capex redemption (C)	R	- 439,000,000	- 4,683,000,000	- 1,382,000,000	- 1,794,000,000	- 3,126,000,000	- 4,057,000,000	- 5,054,000,000	- 6,132,000,000	- 5,715,000,000
EBIT before Royalties after Capex (Eo - C) = E	R	6,971,180,000	10,692,760,000	14,191,068,000	27,633,347,000	35,723,710,938	22,316,466,000	23,284,780,000	15,019,197,500	6,142,912,000
Comment: Royalties										

Table 7.6: Royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine (*continued*).

X=EBIT (E)/Gross Sales Revenue (G)	%	70%	57%	73%	81%	80%	68%	64%	49%	28%
Royalty rate = R%	%	7%	6.8%	7%	7%	7%	7%	7%	5.9%	3.7%
Royalty paid by miner-only (R% * G) = R	R	695,546,600	1,282,279,444	1,362,687,900	2,388,592,080	3,129,209,576	2,312,634,870	2,561,105,820	1,822,807,310	790,630,938
Operating Profit (Eo) less Royalties (R) = E*	R	6,714,633,400	14,093,480,556	14,210,380,100	27,038,754,920	35,720,501,362	24,060,831,130	25,777,674,180	19,328,390,190	11,067,281,062

Source: Kumba Iron ore (2007, 2008 and 2009); Anglo American Kumba Iron ore (2010, 2011); Anglo American Kumba Iron ore (2012, 2013, 2014 and 2015).

Model 1's Coal sector assessment.

Table 7.7: Royalty formula for refined minerals applied to financial information of Sasol's Synfuels (SA) segment.

	Year units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume (T)	t	7,326,000	7,403,000	7,103,000	7,380,000	7,088,000	7,168,000	7,443,000	7,610,000	7,762,200
Sales volume	t	7,379,000	7,503,000	6,983,000	7,522,000	7,088,000	7,071,000	7,439,000	7,534,000	7,762,200
Gross Sales Revenue (G)	R	28,686,242,726	39,173,630,530	37,330,652,964	33,494,898,083	37,111,823,767	48,346,982,704	57,729,264,646	67,078,876,077	55,149,066,316
Operating Costs:										
Cash costs per production ton (O1)	R/t	1,666	1,882	2,473	2,329	2,662	3,085	3,495	3,864	3,712.5
Total production cash costs (O1*T) = (O)	R	12,205,116,000	13,932,446,000	17,565,719,000	17,188,020,000	18,868,256,000	22,113,280,000	26,013,285,000	29,405,040,000	28,816,934,634
Operating profit before Royalty + Capex (G – O) = Eo	R	16,481,126,726	25,241,184,530	19,764,933,964	16,306,878,083	18,243,567,767	26,233,702,704	31,715,979,646	37,673,836,077	26,332,131,682
Comment: Tax shield										
Synfuel Capex redemption (C)	R	- 631,000,000	- 720,000,000	- 816,000,000	- 1,445,000,000	- 1,886,000,000	- 2,467,000,000	- 3,339,000,000	- 4,181,000,000	- 3,465,000,000
EBIT before Royalties after Capex (Eo - C) = E	R	15,850,126,726	24,521,184,530	18,948,933,964	14,861,878,083	16,357,567,767	23,766,702,704	28,376,979,646	33,492,836,077	22,867,131,682
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	55%	63%	51%	44%	44%	49%	49%	50%	41%
Royalty rate = R%	%	4.9%	5%	4.6%	4.05%	4%	4.4%	4.4%	4.5%	3.8%
Royalty paid by refiner (R% * G) = R	R	1,411,441,352	1,958,681,527	1,702,567,982	1,356,424,737	1,494,164,540	2,143,071,130	2,558,804,695	3,014,821,267	2,105,115,866
Operating Profit (Eo) less Royalties (R) = E*	R	15,069,685,376	23,282,503,004	18,062,365,982	14,950,453,346	16,749,403,226	24,090,631,574	29,157,174,951	34,659,014,811	24,227,015,816

Source: Sasol Limited Group (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015a); Sasol Limited (2008, 2011, 2012, 2013, 2014 and 2016); Sasol (2014).

Table 7.8: Royalty formula for unrefined minerals applied to financial information of Anglo American's Thermal coal SA division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exchange rate (Ex)	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	10.9	12.8
SA Anglo coal revenue (Sr)	$	1,538,000,000	2,210,000,000	1,747,000,000	2,105,000,000	2,642,000,000	2,477,000,000	2,187,000,000	2,083,000,000	1,893,000,000
SA Anglo coal Revenue (Ex*Sr) = G	R	10,842,900,000	18,276,700,000	14,692,270,000	15,408,600,000	19,180,920,000	20,336,170,000	21,104,550,000	22,600,550,000	24,192,540,000
Total Operating costs (O)	R	7,451,850,000	11,544,920,000	10,066,770,000	11,497,038,611	12,632,400,000	15,352,700,000	16,482,200,000	17,577,000,000	19,783,440,000
Operating profit before Royalty + Capex (G – O) = Eo	R	3,391,050,000	6,731,780,000	4,625,500,000	3,945,480,000	6,548,520,000	4,983,470,000	4,622,350,000	5,023,550,000	4,409,100,000
Comment: Tax Shield										
Capex	$	121,000,000	100,672,000	60,016,000	61,589,000	107,085,000	156,574,000	214,000,000	93,000,000	104,000,000
Capex equivalent	R	853,050,000	832,557,440	504,734,560	450,831,480	777,437,100	1,285,472,540	2,065,100,000	1,009,050,000	1,329,120,000
Capex redemption (C)	R	- 853,050,000	- 832,557,440	- 504,734,560	- 450,831,480	- 777,437,100	- 1,285,472,540	- 2,065,100,000	- 1,009,050,000	- 1,329,120,000
EBIT before Royalties after Capex (Eo - C) = E	R	2,538,000,000	5,899,222,560	4,120,765,440	3,494,648,520	5,771,082,900	3,697,997,460	2,557,250,000	4,014,500,000	3,079,980,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	23%	32%	28%	23%	30%	18%	12%	18%	13%
Royalty rate = R%	%	3.1%	4.1%	3.6%	3.0%	3.8%	2.5%	1.8%	2.5%	1.9%
Royalty paid by miner (R% * G) = R	R	336,214,500	746,852,673	531,324,177	465,506,873	737,136,033	512,569,457	389,661,639	559,058,306	463,182,700
Operating Profit (Eo) less Royalties (R) = E*	R	3,054,835,500	5,984,927,327	4,094,175,823	3,479,973,127	5,811,383,967	4,470,900,543	4,232,688,361	4,464,491,694	3,945,917,300

Source: Anglo American (2008b, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

Based on the royalty payments of both the refiners and miners-only in Tables 7.1 to 7.8, statistical tables for the t-test using IBM SPSS software were generated. Tables 7.9 and 7.10 present the results of the statistical analysis of the t-test.

Table 7.9: Group Statistics for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

Commodity sector	Type of producer	N	Mean of Royalties paid (R)	Std. Deviation	Std. Error Mean
Gold	Refiner	9	12,684,706	5,385,056	1,795,019
	Miner-only	9	97,489,179	21,470,441	7,156,814
PGMs	Refiner	9	212,916,748	169,026,345	56,342,115
	Miner-only	9	175,900,757	106,315,525	35,438,508
Steel_Iron ore	Refiner	9	389,510,832	176,740,173	58,913,391
	Miner-only	9	1,816,166,060	840,491,157	280,163,719
Synfuels_Coal	Refiner	9	1,971,677,011	555,996,492	185,332,164
	Miner-only	9	526,834,040	140,027,569	46,675,857

These results were further used in the Levene's Test for Equality of Variances and t-test for Equality of means calculations. The results are presented in Table 7.10.

Table 7.10: Independent Samples Test for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Gold	Equal variances assumed	15.409	0.001	-11.493	16	0.000	-84,804,473.2	7,378,487.1	-100,446,167.1	-69,162,779.3
	Equal variances not assumed			-11.493	9.003	0.000	-84,804,473.2	7,378,487.1	-101,495,051.8	-68,113,894.6
PGMs	Equal variances assumed	2.903	0.108	0.556	16	0.586	37,015,990.1	66,560,662.6	-104,086,311.1	178,118,291.4
	Equal variances not assumed			0.556	13.473	0.587	37,015,990.1	66,560,662.6	-106,267,747.4	180,299,727.7
Steel_Iron ore	Equal variances assumed	16.760	0.001	-4.983	16	0.000	-1,426,655,228	286,290,930.7	-2,033,564,889	-819,745,566.8
	Equal variances not assumed			-4.983	8.706	0.001	-1,426,655,228	286,290,930.7	-2,077,638,164	-775,672,292.1
Synfuels_Coal	Equal variances assumed	8.821	0.009	7.560	16	0.000	1,444,842,971	191,119,456.4	1,039,687,822	1,849,998,119
	Equal variances not assumed			7.560	9.011	0.000	1,444,842,971	191,119,456.4	1,012,579,600	1,877,106,342

Comments: From the independent samples test table, the values generated were then further interpreted in terms of the specified 3-step procedures of Econometric analysis phase 1 mentioned in the methodology chapter, whose details are presented in Appendix IV. The details of how these values for model 1 were processed can be found in Appendix V.

Econometrics analysis phase 2:

<u>Realized Beneficiation incentive assessment for gold sector</u>

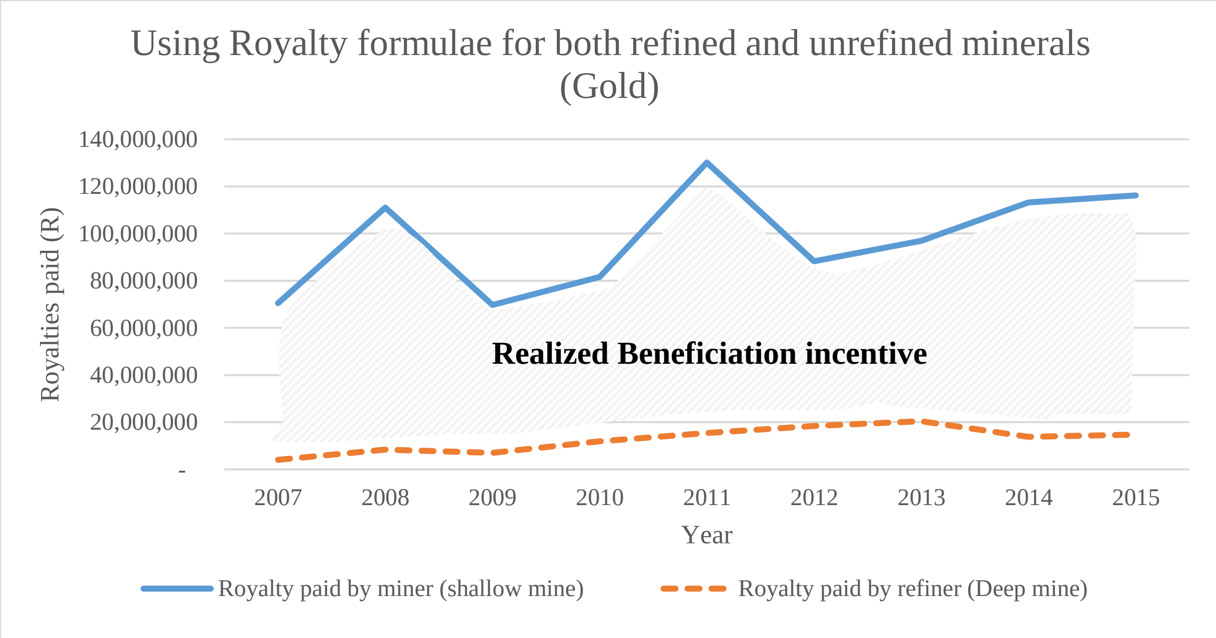

Figure 7.1: Royalty payments for both Refined and 'Unrefined' Gold production[242].

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 7.1, it can be observed that the unrefined production paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

[242] It should be noted that although the two gold mines used for this assessment are at significantly different stages of their lives, their financial performance in those years of assessment were combined for the purpose of reflecting the trend/pattern needed for this research's analysis.

Realized Beneficiation incentive assessment for PGM sector

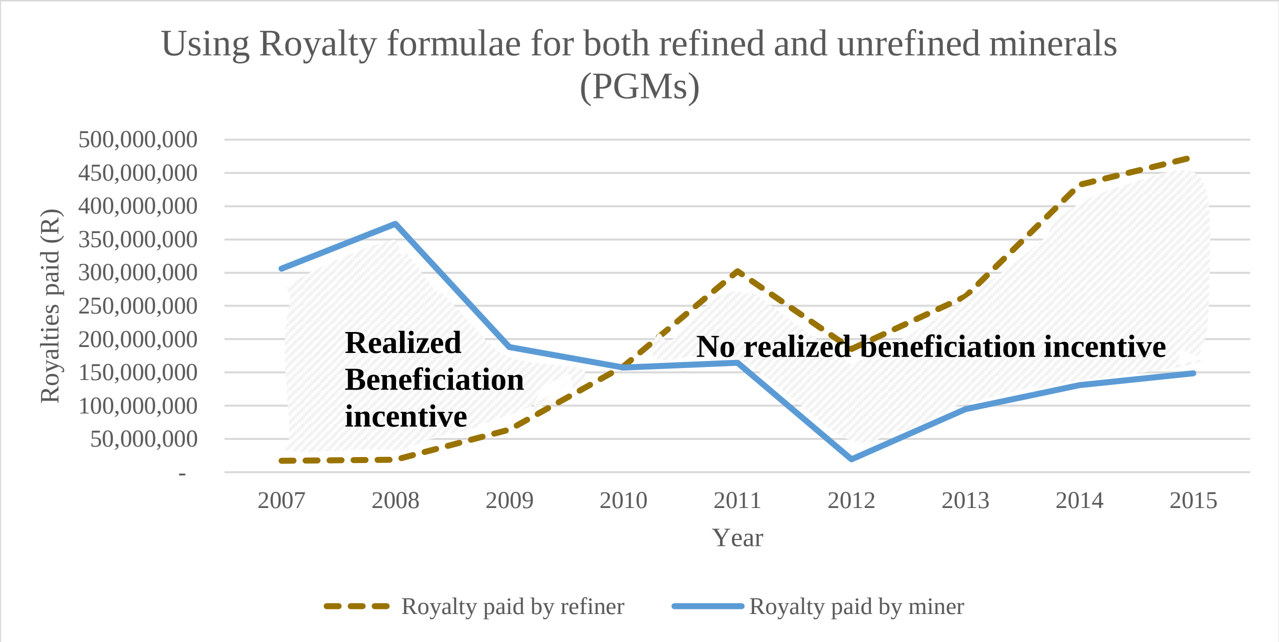

Figure 7.2: Royalty payments for both Refined and Unrefined PGM production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 7.2, it can be observed that in years 2007 to 2009, the unrefined mineral producer paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments in those 3 years. However, from 2010 onwards, the refined mineral producer paid the higher penalty in terms of royalty payments. This signified a disincentive to the refiner.

Realized beneficiation incentive assessment for Steel-iron ore sector

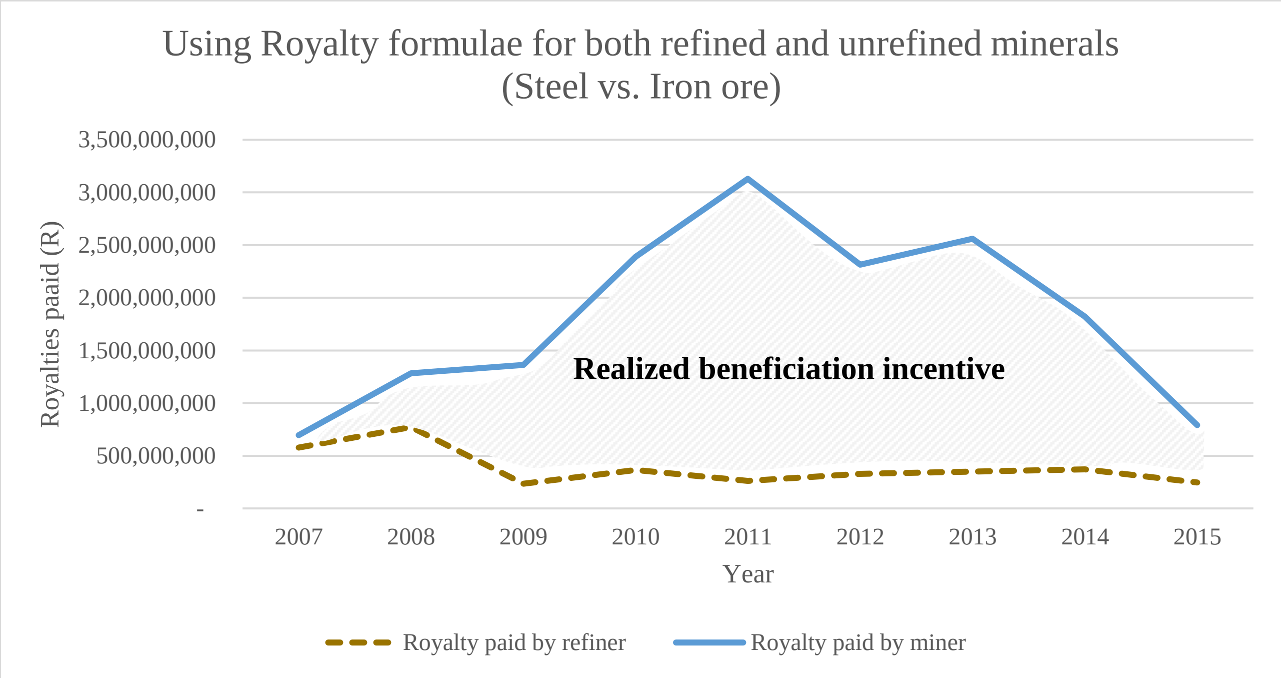

Figure 7.3: Royalty payments for both Refined and Unrefined iron production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 7.3, it can be observed that the unrefined production paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

<u>Realized beneficiation incentive assessment for Coal sector</u>

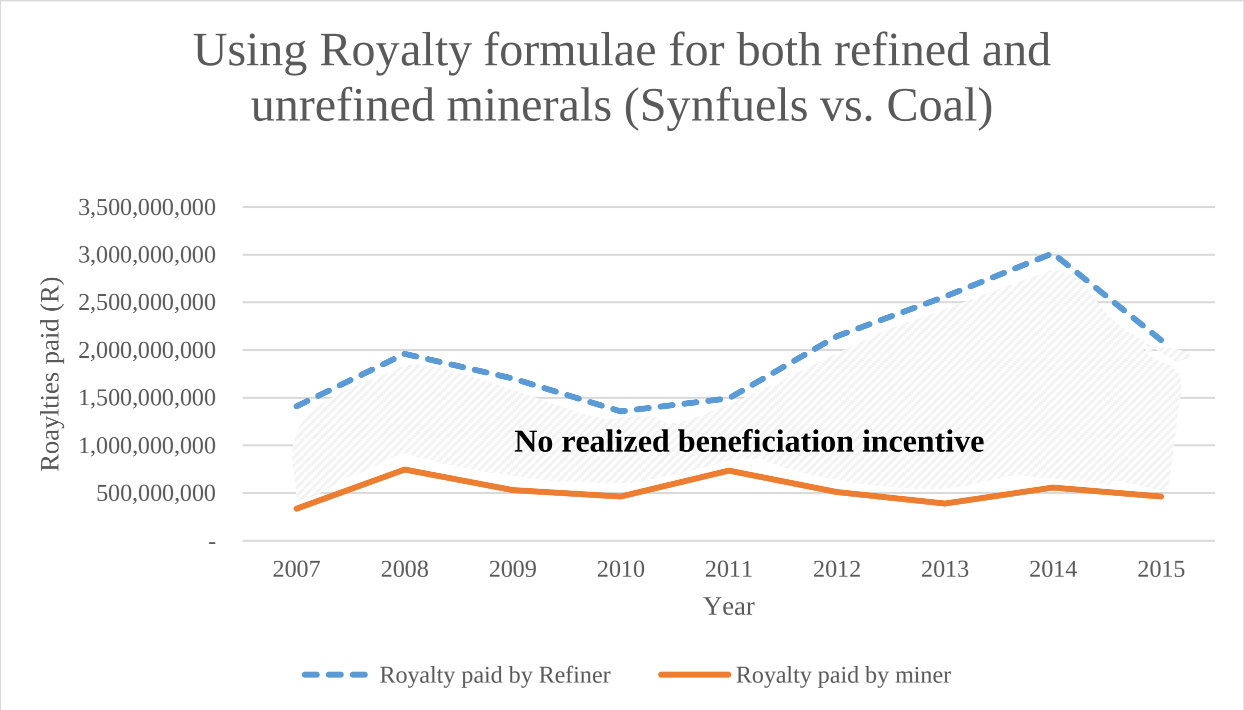

Figure 7.4: Royalty payments for both Refined and Unrefined coal production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 7.4, it can be observed that the refined production paid a higher penalty in terms of royalty payments. Hence, no realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Table 7.11 provides a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases that were conducted.

Table 7.11: Statement of interpretation of results using royalty formulas for both refined and unrefined minerals for all the commodity sectors.

Commodity sectors	Results and Observations	Interpretation	Deduction
Gold: South Deep mine (refiner) vs. Beatrix Mine (miner-only)	Step 1: p-value (Sig.) = 0.001 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible because of difference in magnitude of royalty payments; 2. Royalty rate incentive appears to be functional, although this is not conclusive due to a converse situation when the profitability of the refiner is higher than the 'current' case of assessment.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference	
	Step 3: η2 = 0.89 to 2 d.p. Using Cohen's guidelines, 0.89> 0.14 = very large effect	The magnitude of difference is very large	
	Step 4:	The difference between the means of royalties paid is R84,804,473	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner **paid lesser** royalties than miner-only, because of the 'poor' profitability of the refiner in all the years of assessment.	
PGMs: Mogalakwena mine (refiner) vs.	Step 1: p-value (Sig.) = 0.108 < 0.05	Variances are equal	1. Realized beneficiation incentive were possible for only 3 years, but wiped out for the next 6 years;

Table 7.11: Statement of interpretation of results using royalty formulas for both refined and unrefined minerals for all the commodity sectors (*continued*).

Kroondal mine (miner-only)	Step 2: p-value (Sig. (2-tailed) = 0.586 > 0.05	There is no statistically significant difference	2. Royalty rate incentive had mixed results but bears more towards no existence of incentive. The indication is that it is better to be a Miner-only as the refiner was 'penalized' with its greater royalty payments; 3. The mixed result appears to indicate that the level of refinement does not determine the amount of royalties to be paid. Instead, it is the producer with the greater revenue (whatever the peculiar economic situation of the producer is) that pays greater royalties.
	Step 3: $\eta 2$ not calculated	The magnitude of difference not calculated since there is no statistically significant difference	
	Step 4:	The difference between the means of royalties paid is R37,015,990	
	Realized beneficiation incentive assessment:	Refiner paid lesser royalties than miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more royalties than the miner-only.	
Steel_Iron ore: ArcelorMittal's Flat steel (refiner) vs. Kumba Iron ore (miner-only)	Step 1: p-value (Sig.) = 0.001 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible because of difference in magnitude of royalty payments; 2. Royalty rate incentive appears to be very functional, especially in 2011 when difference in payments ~ R2.87billion. In this commodity-case, the miner-only was severely 'penalized' in terms of royalty payments. 3. It is the intention of the dual formula structure, which is interpreted as achievement of the
	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	There is a statistically significant difference	
	Step 3: $\eta 2 = 0.61$ to 2 d.p. Using Cohen's guidelines,	The magnitude of difference is very large	

Table 7.11: Statement of interpretation of results using royalty formulas for both refined and unrefined minerals for all the commodity sectors (*continued*).

	0.61> 0.14 = very large effect		policy objective.
	Step 4:	The difference between the means of royalties paid is R1,426,655,228	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner **paid lesser** royalties than miner-only	
Synfuels_Coal: Sasol Synfuels SA (refiner) vs. Anglo Coal SA (miner-only)	Step 1: p-value (Sig.) = 0.009 < 0.05	Variances are not equal	1. Realized beneficiation incentive was not possible; 2. Royalty rate incentive was non-existent as refiner was 'penalized' with its greater royalty payments.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference	
	Step 3: η2 = 0.78 to 2 d.p. Using Cohen's guidelines, 0.78> 0.14 = very large effect	The magnitude of difference is very large	

Table 7.11: Statement of interpretation of results using royalty formulas for both refined and unrefined minerals for all the commodity sectors (*continued*).

	Step 4:	The difference between the means of royalties paid is R1,444,842,971	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner **paid more** royalties than miner-only	

7.3.2 Model 1's assessment: Discussion

In addition to the deductions stated in Table 7.11, the general observation from the sectors' assessment in terms of realized beneficiation incentive is that only Steel_Iron ore sector appeared to obtain these savings. For all other sectors assessed (except the peculiar case of gold), the application of the dual royalty formula showed mixed performance in terms of realized beneficiation incentive. However, the mixed performance tended more towards the non-existence of any realized beneficiation incentive for the miner-turned-refiner as the refiner paid more royalties than the miner-only in majority of the years assessed. The general observation that refiners appeared to pay more royalties than miners-only, despite the royalty regime's incentive of a lower royalty rate for refiners, was largely a function of the 'better' profitability of refiners as compared to that of the miners-only. Hence, the implication is that the royalty formulae are at best a revenue-generating and rent-capturing instrument. This was supported by another assessment conducted under model 1, where only the royalty formula for refined minerals was applied to the gold sector (details presented in Appendix VI). The observation from that additional assessment was that the royalty payment performance of both the refiner and miner-only resembled the payment performance in which the shallow mine was treated as the miner-only, while the deep-level mine was treated as the refiner.

These deductions appear to leave the government with exploring several policy options for tweaking the formulae. These options are as follows:

1. Leaving the current royalty formulae as they are, despite the apparent inequity. This inequity, however, is by design so that miners are motivated to become refiners;
2. Reducing royalty rate for refined minerals to increase its realized beneficiation incentive portion, thereby allowing miner-only to continue to bear royalty penalty (as per the Act's specifications) in the current poor economic climate generally and for minerals in particular;
3. Use only refined royalty formula for both classes of producers.
4. Use only unrefined royalty formula for both classes of producers.
5. Use of a tweaked version of the unrefined royalty formula for both classes of producers[243].

[243] It should be noted that options 3, 4 and 5 indicate that the beneficiation objective of the MPRRA would be forfeited, except the royalty base for refined mineral resources be changed to a definition that closely resembles the Net Smelter return (NSR).

These different options need to be tested as per the procedures of the two econometric assessment phases and their results weighed against each other in order to determine the most optimal choice for the government.

7.4 CONCLUSION

As indicated in the methodology chapter, the different phases of the econometric analysis were applied to the PGM sub-sector as well as the three other selected commodity sectors in this chapter. This was for the purpose of determining whether the conclusion from the 2012 study was the same or similar for other sectors of the mining industry or just PGM sector specific. From the assessments carried out in this chapter, it can be deduced that the general conclusion from the chapter (which can be drawn from section 7.3.2) supports the 2012 study's conclusion for all the sectors assessed apart from the Steel_Iron ore sub-sector. In addition, those tests opened up other policy options for adjusting the royalty formulae.

In the following chapter, the additional policy options highlighted in this chapter would be described and tested. The results from the tests are hereinafter referred to as Models 2, 3, 4 and 5.

CHAPTER EIGHT

RE-CONSTRUCTION OF MPRRA'S STRUCTURE FOR PROVISION OF MORE OPTIMAL BENEFICIATION INCENTIVES BASED ON POLICY OPTIONS TWO TO FIVE.

8.1 INTRODUCTION

In the previous chapter, the econometric methods as indicated in chapter five using the two current royalty formulae were applied to the four commodity sectors that were selected. In that chapter, before the methods were applied, the data/information obtained per commodity sector and the assumptions thereof were described. The results of the assessments led to other policy options available for the tweaking of the royalty formulae system.

Based on the policy options mentioned in section 7.3.2 of chapter 7, this chapter consists of a description of each of these other policy options (two to five) made available to the government in chapter seven and presents the results of the econometric tests carried out on them. The results of these tests will also be discussed individually and compared against each other, in this chapter. Comparative discussions would be done in this chapter for the purpose of realising the most optimal policy option available to the government for tweaking the current royalty formulae. Additionally, an implementation plan is proposed for how the most optimal policy option should be effected by the government.

8.2 DESCRIPTION OF THE POLICY OPTIONS FOR TWEAKING THE ROYALTY FORMULAE

In the assessment carried out in chapter seven, the deduction was that five options are available to the government for adjusting the MPRRA in terms of its three main policy objectives. As mentioned in the previous section, each of these policy options would be discussed. A brief summary of policy option one is presented before the other options are described, so as reiterate the background of the other four policy options.

8.2.1 Policy option one

This option (referred to as Model 1) involved the application of the two current royalty formulae to the financial information of the two classes of producers in each of the four selected commodity sectors of this study. For the application of these formulae in this policy option, none of the parameters of the formulae were changed. The details of the tests carried out on this policy option and the peculiarities of the tests were presented in chapter seven and Appendices V and VI. The general observation from the assessment conducted on this policy option in terms of realized beneficiation incentive was that only the Steel_Iron ore sector appeared to obtain these savings. On the application of the dual royalty formulae to all other sectors assessed (except the peculiar case of gold), mixed performance in terms of realized beneficiation incentive was observed. This mixed performance tended more towards the non-existence of any realized beneficiation incentive for the refiner as the refiner paid more royalties than the miner-only in most of the years assessed. Hence, the implication was that the royalty formulae are at best revenue-generating and rent-capturing instruments.

Following these deductions, other possible options emerged for government to explore in tweaking the formulae in order to realise optimal mineral resource use and management. However, it should be noted that this policy option specifies the use of the current dual royalty formulae for refined and unrefined minerals. The details of these formulae as per the MPRRA are stated as follows:

For refined mineral resource,

$$\text{Royalty rate} = 0.5 + \left[\frac{\textit{Earnings before interest and taxes (EBIT)}}{\text{Gross sales in respect of refined mineral resources x 12.5}} \right] \text{x } 100$$

…… Formula (1)

Where,

$\frac{\textit{Earnings before interest and taxes (EBIT)}}{\text{Gross sales in respect of refined mineral resources}}$ = Profitability ratio;

12.5 = Formula constant (F-factor); and

The royalty rate determined in terms of Formula (1) must not be below 0.5% nor exceed 5%.

And

For unrefined mineral resource,

Royalty rate = 0.5 + [$\frac{Earnings\ before\ interest\ and\ taxes}{\text{Gross sales in respect of refined mineral resources x 9}}$] x 100

……Formula (2)

Where,

$\frac{Earnings\ before\ interest\ and\ taxes\ (EBIT)}{\text{Gross sales in respect of refined mineral resources}}$ = Profitability ratio;

9 = F-factor; and

The royalty rate determined in terms of Formula (2) must not be below 0.5% nor not exceed 7%.

With this policy option (one) being the current structure of the MPPRA, it should be noted that if the SA government decides to keep it unchanged, there would be no 'loss' to the government. This is because the MPRRA in its current state would still effectively collect compensatory revenues for the exploitation of SA's non-renewable resources, as well as additional economic rents when the profitability of mining and refining companies are high. This benefit to the government and SA's economy holds whether or not the royalty regime successfully motivates miners to become refiners.

8.2.2 Policy option two

Bearing in mind the policy objective of incentivising refiners, option two involved tweaking only the current royalty formula for refined minerals, while leaving the current formula for unrefined minerals constant. Before statistical tests were carried out on this option, different aspects/parameters of the royalty formula for refined minerals that could yield more realized beneficiation incentive were explored.

From Formula (1)'s parameters, the deduction is that mining companies are expected to pay the maximum royalty rate for refined minerals of 5% when they have maximum profitability ratios of 56.3% and above (see calculation below):

Recalling Formula (1),

Maximum royalty rate (Yr %) =

$$0.5 + [\ \frac{Earnings\ before\ interest\ and\ taxes\ (EBIT)}{\text{Gross sales in respect of refined mineral resources x 12.5}}\ ] \text{ x } 100 = 5\%$$

Where,

Yr % = Royalty rate for refined minerals; and

$[\frac{EBIT}{Gross\ sales}]$ = profitability ratio (X),

Then, Formula (1) can be restated as:

Maximum Yr % = 0.5% + $(\frac{X}{12.5})$ % = 5%

Hence, X = 12.5 (5% - 0.5%)

= 56.3% ……Formula (3)

Going forward, this profitability ratio of 56.3% was assumed/rounded-off to 60% in the MPPRA, thereby indicating that the maximum royalty rate for refined minerals of 5% obtains at profitability ratios of 60% and above (Cawood, 2010).

Furthermore, in observing the profitability ratios (X) of all the refined mineral producers in all the four commodity sectors assessed, it was evident that most of these producers did not realize profitability ratios close to 60% (except for Sasol's synfuels segment) in any of the 9 years assessed. The respective X values observed for refined mineral producers per commodity sector are as follows:

In the Gold sub-sector:

Maximum profitability = 27% (in 2008)

Average profitability for all 9 years = 19%

In the PGM sub-sector:

Maximum profitability = 39% (in 2011)

Average profitability for all 9 years = 22%

In the Steel_Iron ore sub-sector:

Maximum profitability = 33% (in 2007)

Average profitability for all 9 years = 17%

In the Synfuels_coal sub-sector:

Maximum profitability = 63% (in 2008)

Average profitability for all 9 years = 50%

From the above X values, it can be deduced that refined mineral producers had profitability ratios that ranged from 17% (lowest value of the average X ratios) to 63% (highest profitability ratio realized by refined coal producer (synfuels)). The average of all the commodity profitability ratio averages equalled 27%.

Hence, if a profitability ratio of 27% (average of the X averages) is used to tweak the royalty formula for refined minerals, with minimum royalty rate of 0.5% and F-factor of 12.5 remaining constant, then maximum royalty rate for refined minerals is 2.7% (see calculation below).

Maximum Yr % = 0.5% + $(\frac{27}{12.5})\%$

Max Yr = 0.5% + 2.2%

= 2.7% ……Formula (4)

Alternatively, if profitability ratio of 50% (highest X average value – Synfuels) is used to tweak the royalty formula for refined minerals, with minimum royalty rate of 0.5% and F-factor of 12.5 remaining constant, then maximum royalty rate for refined minerals = 4.5% (see calculation below).

Maximum Yr % = 0.5% + $(\frac{50}{12.5})\%$

Max Yr = 0.5% + 4%

= 4.5% ……Formula (5)

Furthermore, the observation from Steel_Iron ore case indicated that in terms of realized beneficiation incentive:

1. The maximum realized beneficiation incentive occurred in year 2011.
2. In that year, Kumba Iron ore's royalty payment was about R3,130,000,000, whilst ArcelorMittal Flat Steel's royalty payment was about R 261,000,000.

3. Therefore, realized beneficiation incentive = R3,130,000,000 - R261,000,000 = R2,869,000,000.
4. This significant realized beneficiation incentive of R2,869,000,000 could cater for ArcelorMittal Flat steel's capex for that year entirely and/or a sizeable portion of Kumba-Sishen's capex for that year.
5. The realized beneficiation incentive was equivalent to royalty rate difference of 5.8% i.e. 7% (Sishen's 2011 royalty rate) – 1.2% (ArcelorMittal's 2011 royalty rate).

In table 8.1, these profitability ratios and their corresponding maximum royalty rates are compared against each other for the purpose is determining the optimal profitability ratio or maximum royalty rate for the formula to be tweaked by.

Table 8.1: Comparison of profitability ratios and their corresponding maximum royalty rates.

	Using profitability ratio of 27%	Using profitability ratio of 50%	Using profitability ratio of 8%[244]
Maximum Yr	2.7%	4.5%	1.2%
Average of the 3 maximum royalty rates	2.8%		
Safe assumption and final choice of maximum royalty rate	2.8% rounded-off to 3% (which is in line with CIF conducted by Cawood (1999).		
Rationale: 1. It is in line with CIF, which could facilitate investor-attractiveness; 2. It is comparable to: a. The royalty rate difference realized from the Steel_Iron ore maximum realized beneficiation incentive case i.e. 7% - 1.2% = 5.8% vs. 7% - 3% = 4%; b. Royalty rate obtained when average profitability of 27% was used (with other parameters kept constant)			

Based on this final royalty rate selection of 3% with the minimum royalty rate of 0.5%, the royalty formula for refined minerals was tweaked using profitability ratio of 27% (average of the X averages) that was rounded-off to 30% (a more realistic profitability ratio) to obtain a new F-factor. The values for maximum Yr and X in Formula (1) were substituted with these

[244] ArcelorMittal Flat steel's profitability ratio in year 2011, when the most significant realized beneficiation incentive occurred.

new values for maximum Yr and X – 3% and 30% respectively. The new F-factor is derived as follows:

Substituting new values for maximum Yr and X in restated Formula (1):

Maximum Yr % = 0.5% + $(\frac{30}{F})$ % = 3%

$$F = \frac{30}{(3\% - 0.5\%)}$$

$= 12$ ……Formula (6)

Hence, model 2 involved tweaking the royalty formula for refined minerals, where F = 12, maximum X = 30%, minimum royalty rate = 0.5% and maximum royalty rate = 3%.

Therefore, it is should be noted that this policy option specifies the use of a tweaked royalty formula for refined minerals with the current royalty formula for unrefined minerals remaining unchanged. The details of the MPRRA formulae specification of this policy option are stated as follows:

For refined mineral resource,

$$\text{Royalty rate} = 0.5 + \left[\frac{\textit{Earnings before interest and taxes (EBIT)}}{\text{Gross sales in respect of refined mineral resources x 12}}\right] \text{x } 100$$

…… Formula (7)

Where,

Profitability ratio = $\frac{\textit{Earnings before interest and taxes (EBIT)}}{\text{Gross sales in respect of refined mineral resources}}$;

Formula constant (F-factor) = 12; and

The royalty rate determined in terms of Formula (7) must not be below 0.5% nor exceed 3%.

And

For unrefined mineral resource,

$$\text{Royalty rate} = 0.5 + \left[\frac{\textit{Earnings before interest and taxes}}{\text{Gross sales in respect of refined mineral resources x 9}}\right] \text{x } 100$$

……Formula (2)

Where,

Profitability ratio = $\frac{\textit{Earnings before interest and taxes (EBIT)}}{\text{Gross sales in respect of refined mineral resources}}$;

Formula constant (F-factor) = 9; and
The royalty rate determined in terms of Formula (2) must not be below 0.5% nor not exceed 7%.

For all the commodities (except for the peculiar case of the gold sub-sector), the tweaked formula for refined minerals based on these new parameters were applied to financial information of the refined mineral producers in those sectors, just like model 1. On the other hand, the current formula for unrefined minerals was applied to that of the miners-only in those sectors. The results of this model's assessment are discussed hereinafter. The magnitude effect of the differences between the royalties paid by the refined and unrefined producers of this model was weighed against those of other models later on.

Model 2's assessment: Results

For model 2's assessment, the financial information of the two classes of producers in all the selected commodity sectors of this study are presented in Tables 8.2 to 8.9. Tables 8.2 to 8.9 can be found in Appendix VII. The royalty payments of both the refiners and miners-only that were calculated in Tables 8.2 to 8.9 were used to generate statistical tables for the t-test using IBM SPSS software. Tables 8.10 and 8.11 consist of the results of the statistical analysis of the t-test and are presented in Appendix VIII. The values generated from the independent samples test tables were then further interpreted in terms of the specified 3-step procedures of Econometric analysis phase 1 mentioned in the methodology chapter, whose details are presented in Appendix IV. The details of how these values for model 2 were processed are also found in Appendix VIII.

Furthermore, the details of the realized beneficiation incentive assessment in terms of the specifications of Econometrics analysis phase 2 of the research methodology as well as a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases are also presented in Appendix VIII. From the assessment on model 2, it was deduced that even though there were no realized beneficiation incentive accruing to the refiner in general, the magnitude of the royalty burden on the refiner was lesser than that of model 1.

Model 2's assessment: Discussion

As indicated in model 1's assessment, the general observation from models 2's assessment with respect to realized beneficiation incentive showed that the application of the dual royalty formula showed mixed performance for all other sectors assessed. As in model 1, the mixed performance tended more towards the non-existence of any realized beneficiation incentive for the miner-turned-refiner as the refiner paid more royalties than the miner-only in majority of the years assessed, except for only Steel_Iron ore sub-sector that appeared to obtain these savings. However, the royalty burden on refiner in both models 2 was much less than that of model 1.

Hence, the implication is that although the royalty formulae appear to be more of just revenue-generating and rent-capturing instruments, in terms of providing more beneficiation incentives, model 2 is more likely to achieve this than other models. It therefore should be noted that if the SA government chooses to adopt policy option two (which specifies that unrefined mineral resource producers would be charged royalties based on Formula (2) while refined mineral producers would be charged royalties based on Formula (7)), it stands a chance of motivating more mining companies to move up the mineral value chain by carrying out more mineral beneficiation than other policy options. This holds because of policy option two's beneficiation incentive of a much more reduced maximum royalty rate from 5% to 3% that refiners would be charged. Additionally, this policy option could potentially enable the collection of more royalties from refiners using the maximum royalty rate because more refining companies are likely to realize a maximum profitability ratio of 30% per period of assessment (specified by policy option two) as opposed to a maximum profitability ratio of 60% per period of assessment (specified by policy option one).

The next section consists the description of model 3 and the results of the assessment carried out on it.

8.2.3 Policy option three

Bearing in mind the deduction from policy option one – model 1's assessment that the royalty formulae are at best revenue-collection instruments, one of the policy options made available to the government is to charge royalties using only either one of the current formulae. The implication of this is that the current beneficiation intent of the Act would be forfeited. Choosing policy option three (hereinafter referred to as model 3) potentially has both positive and negative connotations for both government and investors. In order to fruitfully establish its impacts, it was important to test the option just like the other models (options).

Hence, in this model, only the current formula for refined minerals (Formula 1) was applied to financial information of the two classes of producers in each commodity sector. None of the parameters in the current formula for refined minerals were tampered with in their application in this model.

Model 3's assessment: Results

For model 3's assessment, Tables 8.13 to 8.20 consist of the financial information of the two classes of producers in all the selected commodity sectors of this study. Tables 8.13 to 8.20 are found in Appendix IX. The royalty payments of both the refiners and miners-only that were calculated in Tables 8.13 to 8.20 were used to generate statistical tables for the t-test using IBM SPSS software. Tables 8.21 and 8.22 consist of the results of the statistical analysis of the t-test and are presented in Appendix X. The values generated from the independent samples test tables were then further interpreted in terms of the specified 3-step procedures of Econometric analysis phase 1 mentioned in the methodology chapter. The details of how these values for model 3 were processed are also found in Appendix X.

Furthermore, the details of its realized beneficiation incentive assessment in terms of the specifications of Econometrics analysis phase 2 of the research methodology as well as a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases are also presented in Appendix X.

It should be noted that if the government chooses to adopt this policy option, its application to both mining and refining companies would effectively still collect compensatory revenues for SA's non-renewable resources and economic rents for the government. Additionally, this policy option would provide a 'gain' to the SA government due to the lesser royalty burden on mining companies than that of policy options one, two, four and five because of the reduced maximum royalty rate of 5% instead of 7%, thereby aiding the continuous existence and survival of SA's primary mining sector. However, the magnitude of revenue-collection might be lesser than that of policy options one, four and five because of the reduced maximum royalty rate of 5% instead of 7%. Additionally, on the downside of choosing this policy option, the government would have to forfeit its intent to use the MPRRA to foster mining companies to be engaged in more mineral beneficiation production.

The next section consists of the description of model 4 and the results of the assessment carried out on it.

8.2.4 Policy option four

Just like policy option three (model 3), if government chooses policy option four, it would have to forfeit the beneficiation intent of the current Royalty Act. As with choosing option three, the choice of option four (hereinafter referred to as model 4) potentially has both positive and negative connotations for both government and investors. In order to fruitfully establish its impacts, it was important to test the option just like the other models (options).

Hence, in this model, only the current formula for unrefined minerals (Formula 2) was applied to financial information of the two classes of producers in each commodity sector. None of the parameters in the current formula for unrefined minerals was tampered with in their application in this model.

Model 4's assessment: Results.

For model 4's assessment, Tables 8.24 to 8.31 consist of the financial information of the two classes of producers in all the selected commodity sectors of this study. Tables 8.24 to 8.31 are found in Appendix XI. The royalty payments of both the refiners and miners-only that were calculated in Tables 8.24 to 8.31 were used to generate statistical tables for the t-test using IBM SPSS software. Tables 8.32 and 8.33 consist of the results of the statistical analysis of the t-test and are presented in Appendix XII. From the independent samples test table, the values generated were then further interpreted in terms of the specified 3-step procedures of Econometric analysis phase 1 mentioned in the methodology chapter. The details of how these values for model 4 were processed are also found in Appendix XII.

Furthermore, the details of its realized beneficiation incentive assessment in terms of the specifications of Econometrics analysis phase 2 of the research methodology as well as a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases are also presented in Appendix XII.

Models 3 and 4’s assessments: Discussion

From the assessment on model 3, it was deduced that even though there were no realized beneficiation incentives accruing to the refiner in general, the magnitude of the royalty burden on the refiner was more than that of model 2 but the same as model 1. On the other hand, the royalty burden on the miner-only was less than that of models 1 to 2.

From the assessment on model 4, it was deduced that even though there were no realized beneficiation incentives accruing to the refiner in general, the magnitude of the royalty burden on the refiner was more than that of models 1 to 3. On the other hand, the royalty burden on the miner-only remained the same as in models 1 to 3.

It should be noted that if the government chooses to adopt policy option four, its application to both mining and refining companies would effectively still collect compensatory revenues for SA’s non-renewable resources and economic rents for the government. The magnitude of revenue-collection might be greater than that of policy options one, two and three because of the high maximum royalty rate of 7% that applies to all mineral producers. This policy option would provide a monetary ‘gain’ to the SA government due to the increased royalty burden on refining companies than that of the other policy options. On the downside of choosing policy option four, the government would have to forfeit its intent to use the MPRRA to foster mining companies to be engaged in more mineral beneficiation production.

The next section consists of the description of model 5 and the results of the assessment carried out on it.

8.2.5 Policy option five

As in the case of policy options three (model 3) and four (model 4), if government chooses policy option five (hereinafter referred to as model 5), it would have to forfeit the beneficiation intent of the current Royalty Act. This option involved applying only one formula (tweaked version of the formula for unrefined minerals) to both classes of producers. In order to obtain this tweaked version of the royalty formula, the adjustment of some aspects/parameters of this royalty formula had to be explored. After the final tweaked formula was realized, statistical tests were then carried out on this option just like the other models (options), in order to fruitfully establish its impacts.

Based on the Royalty Act, it is evident that the SA government stipulated a preferred maximum royalty rate by for 'all' minerals as 7%. In the current royalty formulae, it is the formula for unrefined minerals that has its maximum royalty rate as 7%, minimum royalty rate as 0.5% and F as 9. With those parameters, the implication is that mining companies are expected to pay the maximum royalty rate when they have maximum profitability ratios of 58.5% (rounded-off to 60%) and above. However, judging from the financial information of the producers used as proxies to facilitate this study, it was quite evident that not many of them achieved profitability ratios of 60% and more over nine years of assessment. The respective X values observed for unrefined mineral producers (ONLY) per commodity sector are as follows:

In the PGM sub-sector:
Maximum profitability = 63% (in 2007)
Average profitability for all 9 years = 31%

In the Steel_Iron ore sub-sector:
Maximum profitability = 81% (in 2010)
Average profitability for all 9 years = 63%

In the Synfuels_coal sub-sector:
Maximum profitability = 32% (in 2008)
Average profitability for all 9 years = 22%

From the X values stated above, it can be deduced that unrefined mineral producers only had profitability ratios that ranged from 22% (lowest value of the average X ratios) to 81% (highest profitability ratio realized by unrefined iron producer). The average of all the commodity profitability ratio averages for unrefined mineral producers equalled 39%. Furthermore, the average of all the commodity profitability averages of both classes of producers equalled 28%.

Hence, if the profitability ratio of 28% (average of the X averages for all classes of producers accessed) was assumed as a more realistic and achievable profitability ratio per year for each producer than 56.3%, 58.5% or 60%, then it was decided that this maximum X be used to tweak the royalty formula. Therefore, with a minimum royalty rate of 0.5% and maximum royalty rate of 7% as well as a maximum X value of 28% for 'all' mineral producers being used to tweak the royalty formula for unrefined minerals, then the factor (F) would be approximately 4. (See calculation below).

Maximum Yr % = 7% = 0.5% + $(\frac{28}{F})\%$

F = $\frac{28}{(7\% - 0.5\%)}$

= 4.3 ~ 4 ……Formula (8)

A reverse calculation using a factor of 4, a minimum royalty rate of 0.5% and maximum royalty rate of 7% indicated that the maximum X value for 'all' mineral producers would be 26% (see calculation below).

Maximum Yr % = 7% = 0.5% + $(\frac{X}{4})\%$ ……Formula (9)

X = $(7\% - 0.5\%)\ x\ 4$ = 26%

Hence, in this model, only the current formula for unrefined minerals was tweaked (where F = 4, maximum X = 26%, minimum royalty rate = 0.5% and maximum royalty rate = 7%) and applied to financial information of the two classes of producers in each commodity sector. Therefore, this policy option specifies the use of a tweaked royalty formula for unrefined minerals, whose details are stated as follows:

For all mineral resources,

Royalty rate = 0.5 + [$\frac{Earnings\ before\ interest\ and\ taxes\ (EBIT)}{\text{Gross sales in respect of refined mineral resources x 4}}$] x 100

…… Formula (10)

Where,

Profitability ratio = $\frac{Earnings\ before\ interest\ and\ taxes\ (EBIT)}{\text{Gross sales in respect of refined mineral resources}}$;

Formula constant (F-factor) = 4; and

The royalty rate determined in terms of Formula (10) must not be below 0.5% nor exceed 7%.

Model 5's assessment: Results and discussion.

For model 5's assessment, Tables 8.35 to 8.42 consist of the financial information of the two classes of producers in all the selected commodity sectors of this study. Tables 8.35 to 8.42 are found in Appendix XIII. The royalty payments of both the refiners and miners-only that were calculated in Tables 8.35 to 8.42 were used to generate statistical tables for the t-test using IBM SPSS software. Tables 8.43 and 8.44 consist of the results of the statistical analysis of the t-test and are presented in Appendix XIV. From the independent samples test table, the values generated were then further interpreted in terms of the specified 3-step procedures of Econometric analysis phase 1 mentioned in the methodology chapter. The details of how these values for model 5 were processed are also found in Appendix XIV.

Furthermore, the details of its realized beneficiation incentive assessment in terms of the specifications of Econometrics analysis phase 2 of the research methodology as well as a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases are also presented in Appendix XIV.

From the assessment on model 5, it was deduced that no realized beneficiation incentive accrued to the refiner generally. Also, the magnitude of the royalty burden on both classes of producers was more than that of models 1 to 4. This was due to the lower profitability ratio and maximum royalty rate parameters of model 5. The next section consists the discussion of the assessments carried out on models 1 to 5.

With a maximum profitability ratio of 26% being more achievable than 28%, 56.3% or 58.5%, this implies that if government chooses this policy option (five), it can expect more mining companies and refining companies to pay royalties based on the maximum royalty rate of 7% per year. However, with the use of this policy option, government can still compensate the already 'penalized' refiners due to the added costs of refinement they incur as well as the downward pressure on revenues that they have been experiencing of recent, by allowing the royalty base to have more refinement costs deducted before applying the royalty rate.

8.3 DISCUSSIONS OF THE TEST RESULTS OF THE FIVE MODELS.

Having tested all the other four policy options (and models) that resulted from the test on first policy option, it is important to compare all their results against each other. This is for the purpose of identifying the most optimal policy option, bearing in mind the three main objectives of the Royalty Act.

Table 8.46 consists of the results from the two econometric assessment phases of all five models, placed next to each other. Table 8.47 consists of a summary of deductions for each model, which were based on the use of economic theories/conditions, mathematics and statistical interpretations.

Table 8.46: Presentation of the econometrics results of all the five models.

Commodity sectors	**Using both formulae in current state**	**Using both formulae (with tweaked royalty formula for refined minerals having F = 12, max X = 30%, max royalty rate = 3%)**	**Using royalty formula for refined minerals only**	**Using royalty formula for unrefined minerals only**	**Using tweaked royalty formula for unrefined minerals only (with F = 4, max X = 26%, max royalty rate = 7%)**
Gold: South Deep mine (Refiner) vs. Beatrix Mine (refiner)	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05
	Step 3: $\eta 2 = 0.89$	Step 3: $\eta 2 = 0.89$	Step 3: $\eta 2 = 0.89$	Step 3: $\eta 2 = 0.89$	Step 3: $\eta 2 = 0.90$
	Step 4: The difference between the means of royalties paid was about R84,804,500.	Step 4: The difference between the means of royalties paid was about R65,152,600.	Step 4: The difference between the means of royalties paid was about R62,794,400.	Step 4: The difference between the means of royalties paid was about R84,804,500.	Step 4: The difference between the means of royalties paid was about R182,043,300.
	Realized beneficiation incentive assessment: For all the years of assessment, refiner (deep mine) paid lesser royalties than miner-only (shallow mine), because	Realized beneficiation incentive assessment: For all the years of assessment, refiner (deep mine) paid lesser royalties than refiner (shallow mine), because	Realized beneficiation incentive assessment: For all the years of assessment, refiner (deep mine) **paid lesser** royalties than refiner (shallow mine).	Realized beneficiation incentive assessment: For all the years of assessment, refiner (deep mine) **paid lesser** royalties than refiner (shallow mine). Shallow	Realized beneficiation incentive assessment: For all the years of assessment, refiner (deep mine) **paid lesser** royalties than refiner (shallow mine). The

Table 8.46: Presentation of the econometrics results of all the five models (*continued*).

	of the 'poor' profitability performance of the 'refiner' in all the years of assessment.	of the 'poor' profitability performance of the deep mine in all the years of assessment.		mine's royalties were more than when formula for refined minerals was applied.	magnitude of the shallow mine's royalties was more than that of the other 5 models.
PGMs: Mogalakwena mine (refiner) vs. Kroondal mine (miner-only)	Step 2: p-value (Sig. (2-tailed) = 0.586 > 0.05	Step 2: p-value (Sig. (2-tailed) = 0.687 > 0.05	Step 2: p-value (Sig. (2-tailed) = 0.210 > 0.05	Step 2: p-value (Sig. (2-tailed) = 0.237 > 0.05	Step 2: p-value (Sig. (2-tailed) = 0.104 > 0.05
	Step 3: η2 not calculated	Step 3: η2 not calculated	Step 3: η2 not calculated	Step 3: η2 not calculated	Step 3: η2 not calculated
	Step 4: The difference between the means of royalties paid was about R37,016,000.	Step 4: The difference between the means of royalties paid was about R25,410,000.	Step 4: The difference between the means of royalties paid was about R81,918,600.	Step 4: Step 4: The difference between the means of royalties paid was about R104,329,700.	Step 4: Step 4: The difference between the means of royalties paid was about R228,423,640.
	Realized beneficiation incentive assessment[245]: Refiner paid lesser royalties than miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more	Realized beneficiation incentive assessment: Refiner paid lesser royalties than miner-only from 2007 to 2010, but from 2010 to 2015, the refiner paid more	Realized beneficiation incentive assessment: Refiner paid lesser royalties than Miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more	Realized beneficiation incentive assessment: Refiner paid lesser royalties than miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more	Realized beneficiation incentive assessment: Refiner paid lesser royalties than miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more

245 For PGM sector, refiner was penalized for a greater part of the assessment period in four models, except model 3.

Table 8.46: Presentation of the econometrics results of all the five models (*continued*).

	royalties than the miner-only.	royalties than the miner-only.	royalties than the miner-only (but magnitude of miner-only’s payment was lesser than when royalty formula for unrefined minerals was applied).	royalties than the miner-only (but magnitude of miner-only’s payment was more than when royalty formula for refined minerals was applied).	royalties than the miner-only (just like in other models except for model 3). This signified a disincentive to the refiner.
Steel_Iron ore: ArcelorMittal Flat steel (Refiner) vs. Kumba Iron ore (miner-only)	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.004 < 0.05
	Step 3: $\eta 2 = 0.61$	Step 3: $\eta 2 = 0.61$[246]	Step 3: $\eta 2 = 0.55$	Step 3: $\eta^2 = 0.56$	Step 3: $\eta^2 = 0.44$
	Step 4: The difference between the means of royalties paid was about R1,426,655,230.	Step 4: The difference between the means of royalties paid was about R1,424,059,400.	Step 4: The difference between the means of royalties paid was about R920,456,900.	Step 4: The difference between the means of royalties paid was about R1,315,993,340.	Step 4: The difference between the means of royalties paid was about R1,019,820,540.

246 Magnitude of difference (Miner was penalized more) is stronger using 1st model, followed by 2nd model, 4thmodel, then 5th. Only Steel_Iron ore case shows ‘real’ beneficiation incentive.

Table 8.46: Presentation of the econometrics results of all the five models (*continued*).

	Realized beneficiation incentive assessment: For all the years of assessment, refiner paid lesser royalties than miner-only	Realized beneficiation incentive assessment: For all the years of assessment, refiner paid lesser royalties than miner-only. Realized beneficiation incentive increased and was the 2nd largest among the models, judging from the magnitude of difference of this model.	Realized beneficiation incentive assessment: 1. In 2009, the refiner paid more royalties than the miner-only; 2. For all other years of assessment, refiner paid lesser royalties than miner-only.	Realized beneficiation incentive assessment: 1. In 2009, the refiner paid **more** royalties than the miner-only; 2. For all other years of assessment, refiner **paid lesser** royalties than miner-only.	Realized beneficiation incentive assessment: 1. In 2007 and 2008, the refiner paid higher royalties, more than the values in model 5. 2. From 2009 onwards, miner-only paid more royalties than refiner. The magnitude of these royalty payments for the miner-only was similar to its magnitude in model 5, but the magnitude of the royalties paid by refiner was much higher than in model 5. Even though it appeared that some

Table 8.46: Presentation of the econometrics results of all the five models (*continued*).

					3. realized beneficiation incentive accrued to the refiner from 2009 to 2015, the magnitude of the realized beneficiation incentive was less than that of all the other models.
Synfuels_Coal: Sasol Synfuels SA (refiner) vs. Anglo Coal SA (miner-only)	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05
	Step 3: η2 = 0.78	Step 3: η2 = 0.69	Step 3: η2 = 0.81	Step 3: η2 = 0.82[247]	Step 3: η2 = 0.75
	Step 4: The difference between the means of royalties paid was about R1,444,843,000.	Step 4: The difference between the means of royalties paid was about R820,170,800.	Step 4: The difference between the means of royalties paid was about R1,566,430,200.	Step 4: The difference between the means of royalties paid was about R2,135,182,000.	Step 4: The difference between the means of royalties paid was about R2,135,379,800.

[247] Magnitude of difference is stronger (Refiner was penalized more) using 5th model, followed by 4th model, 3rd model, 1st then 2nd; Realized beneficiation incentive non-existent.

Table 8.46: Presentation of the econometrics results of all the five models (*continued*).

	Realized beneficiation incentive assessment: For all the years of assessment, refiner paid more royalties than miner-only.	Realized beneficiation incentive assessment: For all the years of assessment, refiner paid more royalties than miner-only.	Realized beneficiation incentive assessment: For all the years of assessment, refiner paid more royalties than miner-only.	Realized beneficiation incentive assessment: For all the years of assessment, refiner paid more royalties than miner-only. Refiner's royalty payments were more than when royalty formula for refined minerals was applied.	Realized beneficiation incentive assessment: For all the years of assessment, refiner paid more royalties than miner-only, and the magnitude of the refiner's payments was more than that of all the other models. The magnitude of the royalties paid by the miner-only was also much more than that of all the other models.

As mentioned previously, the next table (8.47) would consist of a comparison between the deductions from each model's assessment in the context of their impact from the perspectives of both government and mining companies/investors. By comparing the different deductions of each model against each other, the goal is to realize resounding support for the final choice of the most optimal policy option with regards to tweaking the royalty formulae.

Table 8.47: Summary of deductions from the five econometric models.

	Model 1	Model 2	Model 3	Model 4	Model 5
Impact of the models from Government's perspective	1. It is a functional revenue-collection instrument.	1. It is a functional revenue-collection instrument, but magnitude of collection could be potentially less than models 1, 3, 4 and 5. This is because of the reduced maximum royalty rate for refiners.	1. It is a functional revenue-collection instrument, but magnitude of collection could be potentially less than models 5, 4, 2 and 1. This is because the reduced maximum royalty rate for miners-only could lead to lesser amount of money being received from them than when both formulae were in place.	1. It is a functional revenue-collection instrument, but magnitude of collection could be potentially more than models 1 - 3. This is because the increased maximum royalty rate for refiners could lead to greater amount of money being received from them than when both formulae were in place.	1. It is a functional revenue-collection instrument, but magnitude of collection could be potentially more than models 1 - 5. This is because the increased maximum royalty rate and lower maximum profitability ratio for all producers would lead to greater amount of money being received from them than when both formulae were in place.

Table 8.47: Summary of deductions from the five econometric models (*continued*).

	2. It collects compensatory charge for exploiting SA's non-renewable resources.	2. It collects compensatory charge for exploiting SA's non-renewable resources.	2. It collects compensatory charge for exploiting SA's non-renewable resources.	2. It collects compensatory charge for exploiting SA's non-renewable resources.	2. It collects compensatory charge for exploiting SA's non-renewable resources.
	3. Its profitability-dependent nature captures rent as the magnitude of revenue receipts flows in sync with profitability performance.	3. Its profitability-dependent nature captures rent as the magnitude of revenue receipts flows in harmony with profitability performance.	3. Its profitability-dependent nature captures rent as the magnitude of revenue receipts flows in harmony with profitability performance.	3. Its profitability-dependent nature captures rent as the magnitude of revenue receipts flows in harmony with profitability performance.	3. Its profitability-dependent nature captures rent as the magnitude of revenue receipts flows in harmony with profitability performance.
	4. Judging from its effect on gold, platinum and synfuels (coal), it appears to be a	4. It could potentially reduce 'tax on beneficiation' as the royalty cost penalty on refiners is reduced	4. It does not reduce 'tax on beneficiation' as the royalty cost penalty/burden on refiners continues as	4. It increases 'tax on beneficiation' than other models as the royalty cost penalty/burden on	4. It increases 'tax on beneficiation' than other models as the royalty cost penalty/burden on both refiners and miners-

Table 8.47: Summary of deductions from the five econometric models (*continued*).

	'tax on beneficiation' because the refiners in these sectors were penalized with paying more royalties than miners-only in at least 6 years consistently (especially in the years after the Act came into force).	as compared to models 5, 4, 3, 1.	current terms. However, it could potentially reduce royalty cost burden on miners-only as compared to models 1, 2, 4 and 5.	refiners increases more than current terms. Royalty cost burden on miners-only remains like models 1, 2 and 5.	only increases more than current terms. Royalty cost burden on miners-only is seemingly more than models 1 – 4, due to lower profitability ratio.
	5. The calculations of dual formula's specifications are complex[248] and	5. The complexity of calculations due to the dual formula's specifications still	5. The complexity of calculations associated with dealing with two	5. The complexity of calculations associated with dealing with two	5. The complexity of calculations associated with dealing with two formulae is reduced

[248] Cawood (2010) did however critically note that: "Balancing the design considerations proved to be a very long and complex process in South Africa and political pressure caused the Act to perhaps become too complex with regard to the requirements of the gross sales base."

Table 8.47: Summary of deductions from the five econometric models (*continued*).

	the State might not have requisite technical and administrative capacity to administer/monitor its implementation correctly.	holds like model 1 and the State might not have requisite technical and administrative capacity to administer/monitor its implementation correctly.	formulae is reduced as compared to models 1 – 3. The State can have requisite technical and administrative capacity to administer/monitor its implementation correctly.	formulae is reduced as compared to models 1 – 3. The State can have requisite technical and administrative capacity to administer/monitor its implementation correctly.	as compared to models 1 – 3. The State can have requisite technical and administrative capacity to administer/monitor its implementation correctly.
		6. The max royalty rate of the formula for refiners is triggered when X = 30% or more. 30% is a more realistic and achievable profitability ratio by more refiners than	6. The max royalty rate of the formula for refiners is triggered when X = 56.25% (~ 60%) or more like model 1. Therefore, this model has the potential of collecting revenues using max	6. The combination of increased max royalty rate on refiners and max X value like model 1, makes this model to potentially collect revenues from same number of refiners	6. The combination of increased max royalty rate for all producers and acceptable lower max X value enables this model to potentially collect revenues from much more refiners and miners-only than in the case of any

Table 8.47: Summary of deductions from the five econometric models (*continued*).

		the X value of the other models. Therefore, this model has the potential of collecting higher revenues using max royalty formula from more refiners than in the case of models 1, 3 and 4.	royalty formula from same number of refiners as in the case of models 1 and 4.	and miners-only as in the case of model 1.	of the models.
Impact of models from investors and mining companies' perspectives	1. Royalty cost burden is not an incentive to refiners currently.	1. Royalty cost burden is not an incentive to majority of refiners, but its magnitude is lesser than models 5, 4 and 1.	1. Royalty cost burden is not an incentive to majority of refiners, its magnitude is same as model 1.	1. Royalty cost burden is not an incentive to majority of refiners; its magnitude is more than models 1 – 3.	1. Royalty cost burden is not an incentive to majority of refiners; its magnitude is more than any of the other models.
	2. It could pose a threat of losing a major economic sector and jobs, as	2. It could pose a threat of losing a major economic sector and jobs, as refiners still	2. It has the least chance of posing a threat of losing a major economic	2. It could pose a threat of losing a major economic sector and jobs as refiners'	2. It could pose a threat of losing a major economic sector and jobs as refiners' penalty is

Table 8.47: Summary of deductions from the five econometric models (*continued*).

	refiners appear to be paying more royalties (judging from gold (real case), PGM and Coal sub-sectors.	appear to be paying more royalties but not as much as in model 1.	sector and jobs, as miners-only are somewhat kept in business as compared to the other models.	penalty is increased, miners-only are still penalized as compared to the other models.	increased more than other models. Miners-only are also penalized more than the other models.
		3. It has the potential of being an investment-attraction instrument to refiners and miners that are considering turning into refiners because of reduced max royalty rate of 3%.	3. Royalty cost burden is not increased as already 'incentivised' refiners continue paying royalties as previous/current terms.	3. Royalty cost burden is increased for refiners, miners continue paying royalties as previous/current terms.	3. Royalty cost burden is increased for both refiners and miners-only, as they would be paying more royalties than previous/current terms.
			4. The burden on miners-only is reduced especially in light of implementation	4. The burden on miners-only is increased especially in light of implementation of	4. The burden on miners-only is increased especially in light of implementation of "developmental price"

Table 8.47: Summary of deductions from the five econometric models (*continued*).

			of "developmental price" regulatory intent and other adverse economic conditions.	"developmental price" regulatory intent and other adverse economic conditions.	regulatory intent and other adverse economic conditions.
			5. It has the potential of being an investment-attraction instrument to miners-only.	5. It has the potential of not being an investment-attraction instrument.	5. It has the potential of not being an investment-attraction instrument.

8.4 CONCLUSION

From the evaluations carried out on the five policy options for tweaking the MPRRA, it was found that if the current MPRRA's reduced rate provision for refined products is still kept in use and it is the only incentive given to motivate miners to become refiners, this is not substantial enough. Hence, the implication therefore was that the policy objective of using the MPRRA to foster mineral beneficiation by allowing for a reduced royalty rate for refined minerals, viewed from the perspective of the representatives mining companies (except Steel_Iron ore sector), would not be achieved.

Additionally, it was realized that from the assessments of the five policy options, one policy option stood out as being the most beneficial. In the era where the priority of realizing more mineral value-addition in SA is more critical, this most optimal and beneficial policy option would be the use of model 2. To summarise, the major policy recommendations from this chapter are:

1. If the most important purpose of the mining royalty is to earn economic rent, then the government should leave the royalty system as it is currently (i.e. Policy option one);
2. If the most important purpose is to motivate miners to become refiners, then the government should leave the unrefined royalty as it is currently but change the F-Factor for the formula for refined minerals from 12.5 to 12 and cap the maximum royalty rate for refined production at 3% (as per Policy option two);
3. If the most important purpose of the mining royalty is to earn more economic rent than is being currently received, but wants to relieve SA's primary mining sector in order to ensure its continuous existence, then the government should to apply the royalty formula for refined production only (policy option three) to both classes of mineral producers;
4. If the most important purpose of the mining royalty is to earn much more economic rent than is being currently received (more rent than policy option three's collection capability), then the government should to apply the royalty formula for unrefined production only (policy option four) to both classes of mineral producers; and
5. If the most important purpose of the mining royalty is to earn much more economic rent than is being currently received (more rent than the collection capabilities of policy options one to four), then the government should to apply the tweaked royalty formula for unrefined production only, which specifies that F-Factor for the formula be changed

from 9 to 4 and cap the maximum royalty rate for refined production at 7% (policy option five) to both classes of mineral producers.

The next chapter would consist of the assessment of all the five policy options in terms determining the value that each model would add based on different proportions of refinement cost (as a percentage of sales price). This assessment would provide further support for the choice of the use of Model 2 as the most optimal policy option. The chapter would also outline how this beneficial modified version of the MPRRA (using model 2) should be brought into effect by the SA government in an implementation plan.

CHAPTER NINE

DEDUCTION OF THE MOST OPTIMAL POLICY OPTION AND PROPOSED IMPLEMENTATION PLAN.

9.1 INTRODUCTION

In the previous chapter, the four additional policy options (Models 2 – 5) generated to tweak the current MPRRA regime were assessed in terms of the econometric methodology phases of this research. From those assessments and on the backdrop of this era, where the realization of more mineral value-addition in SA is highly crucial, it was realized that one policy option stood out as being the most optimal and beneficial – the use of model 2.

In order to further substantiate this choice of optimal policy option, this chapter consists of the assessment of all the five policy options in terms determining the value that each model would add based on different proportions of refinement cost (as a percentage of sales price), using Cawood's 2011 model (specified in Chapter 1). Also, this chapter outlines how this beneficial modified version of the MPRRA (using model 2) should be brought into effect by the SA government in an implementation plan.

9.2 VALUE-ADDED ASSESSMENT OF THE FIVE POLICY OPTIONS.

As previously indicated, this section consists of the assessment and observations made with respect to the value-added to the miner-turned-refiner depending on different proportions of refinement costs as a percentage of sales price. This assesement is based on the work carried out by Cawood (2011b) in which he sought to check the effect that different proportions of refinement cost (as a percentage of sales price) has in terms of value-added (as deduced from Bradley's 1986 model) in the context of the peculiar provisions of the MPRRA. In Cawood's 2011 model, different levels of combined cost of concentrate plus target EBIT magnitudes and different proportions of refinement costs were varied. Observations were then made at refinement costs of 10%, 20% and 30% of sales price.

9.2.1 Value-add assessment for Model 1

Noting one of the peculiarities of the SA royalty system as opposed to that of WA system, which is that there is a minimum (compulsory) royalty payment rate of at least 0.5% in cases of no profitability and irrespective of level of refinement, Figure 9.1 illustrates Cawood's work in terms of highlighting the relationship between royalty rates and sales price.

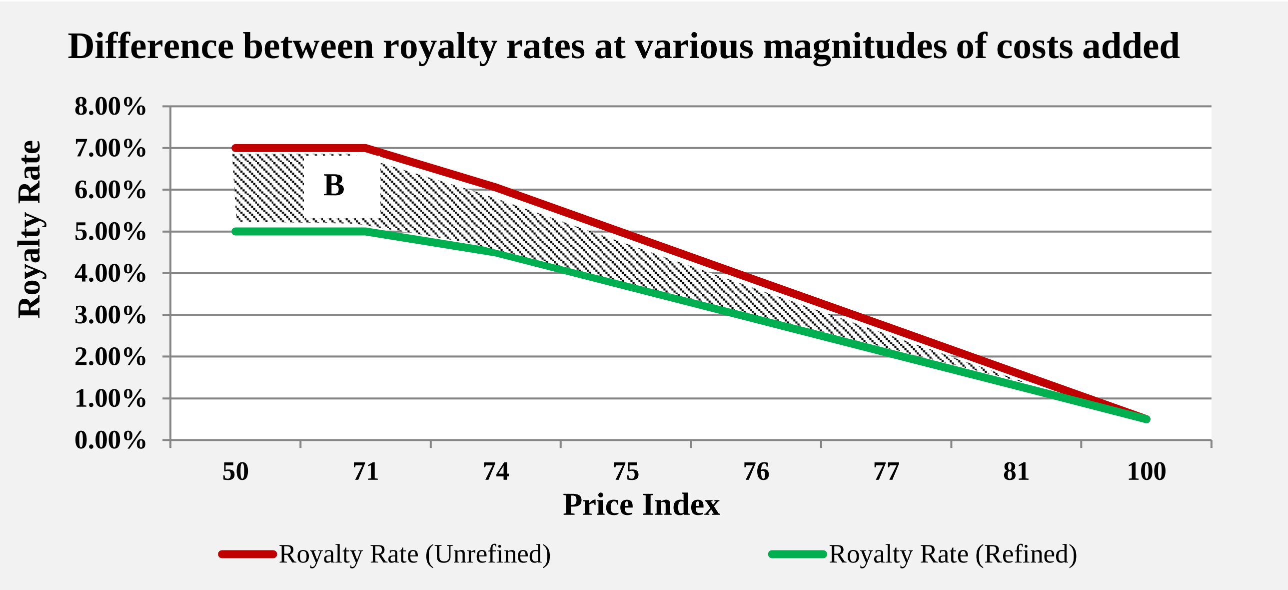

Figure 9.1: The relationship between royalty rates and sales price for model 1. Adapted from Cawood (2011a).

In Figure 9.1, sales price for final product (either unrefined or refined final product) on the price index axis, was used as a proxy for gross revenue and it consists of different proportions of production costs plus EBIT (profit). This means that at the price index of 100, the proportion of production costs is equal to sales price received, implying that no profit was made. Therefore, the royalty rate of 0.5% is paid by the producer at price index 100. Furthermore, it should be noted that the reduction in price indices represents the case in which the lower the price index, the lower the proportion of production costs in relation to sales price, and invariably, the higher the EBIT portion. Hitherto, at each level of price index, the royalty rate that the producer would pay is specified. Area B like Area A in Bradley's work represents realized beneficiation incentive.

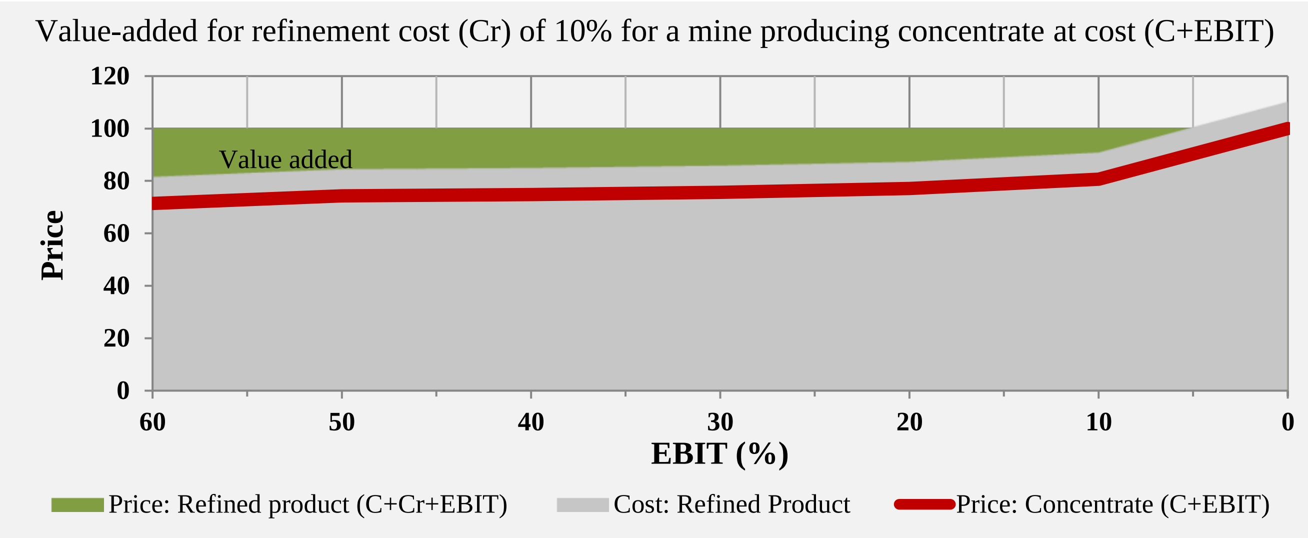

Figure 9.2: Value-added for refinement cost of 10%.

In the Figures 9.2 – 9.4, it can be seen that value-added diminishes as refinement cost increases from 10% to 20% to 30%. Value-add completely vanishes when refinement cost is 30%.

At refinement cost of 10%, value-added portion begins from EBIT portion of about 5% and increases as the EBIT portion increases to 60%. At refinement cost of 10%, the size of the value-added portion when EBIT portion is between 5% and 20% is about 10% of sales price. The size of the value-added portion when EBIT portion is 20% and above is less than 20% of sales price.

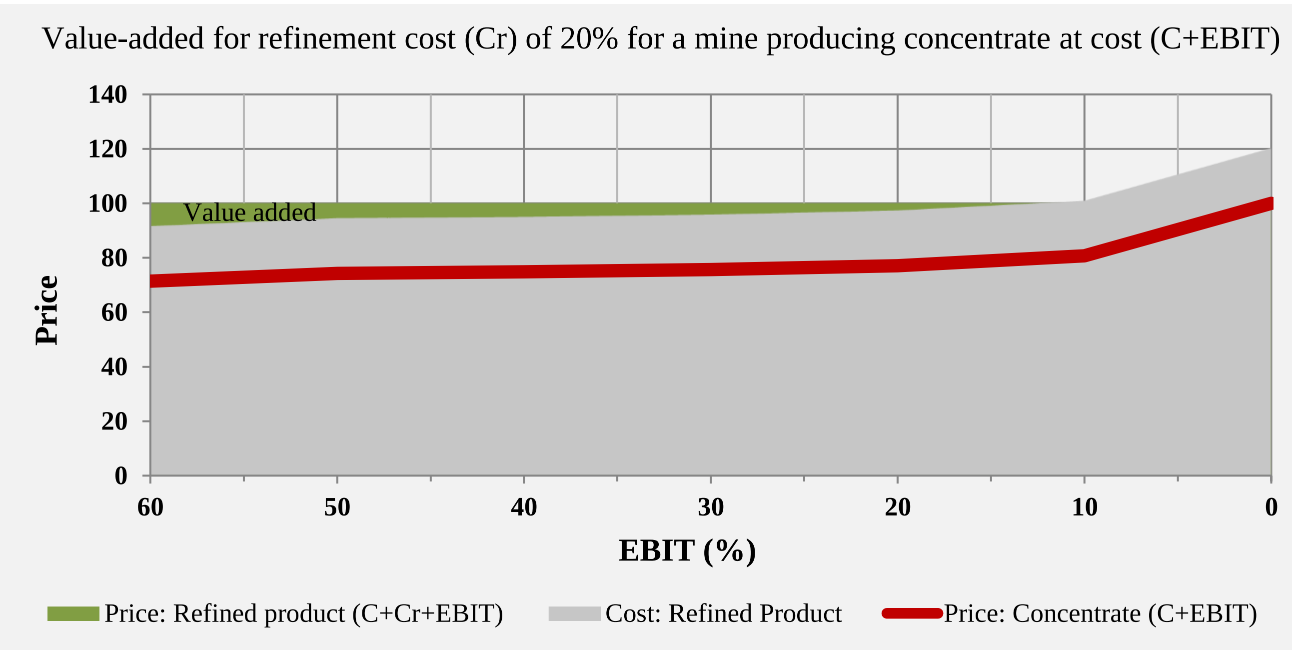

Figure 9.3: Value-added for refinement cost of 20%.

At refinement cost of 20%, value-added portion begins from EBIT portion of about 12% and increases as the EBIT portion increases to 60% of sales price. At refinement cost of 20%, the size of the value-added portion when EBIT portion is between 12% and 20% is about 5% (or less) of sales price. The size of the value-added portion when EBIT portion is 20% and above is about 10% (or less) of sales price.

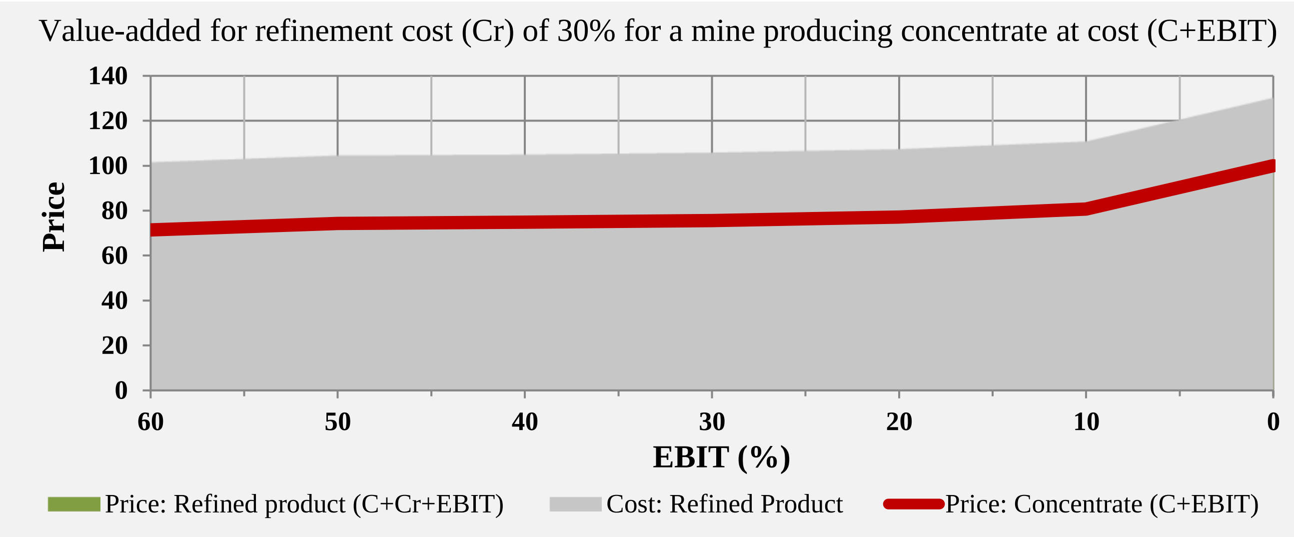

Figure 9.4: Value-added for refinement cost of 30%.

At refinement cost of 30%, value-added portion is non-existent when refinement cost is 30% and above.

9.2.2 Value-add assessment for Model 2

As specified in chapter 8, model 2 retains the peculiarity of the SA royalty system, where there is a minimum (compulsory) royalty payment rate of 0.5% in cases of no profitability and irrespective of level of refinement for both the formulae for refined and unrefined minerals. However, the formula for refined minerals was adjusted to have a maximum royalty rate of 3%, F-factor as 12, max profitability ratio as 30%. Based on this modification, Figure 9.5 illustrates the relationship between royalty rates and sales price.

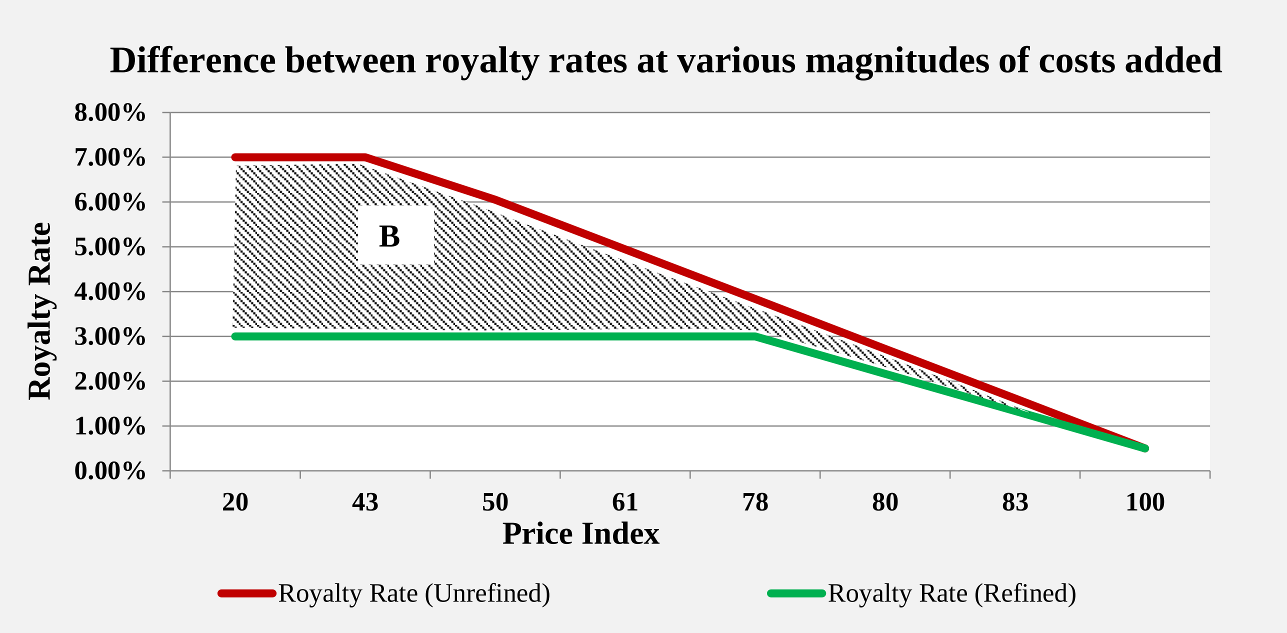

Figure 9.5: The relationship between royalty rates and sales price in terms of Model 2's specifications. Adapted from Cawood (2011a).

As in the case of model 1, on the price index axis of the Figure 9.5, sales price for final product (either unrefined or refined final product) was used as a proxy for gross revenue and it consists of different proportions of production costs plus EBIT (profit). At the price index of 100, it means that the proportion of production costs is equal to sales price received, implying that no profit was made. Therefore, the royalty rate of 0.5% is still paid by the producer at price index 100. Furthermore, it should be noted that the reduction in price indices represents cases in which the lower the price index, the lower the proportion of production costs in relation to sales price is, and inversely, the higher the EBIT portion. Hitherto, at each level of price index, the royalty rate that the producer would pay is specified. For refined minerals, it can be observed that from the price index of 78 and lesser, which indicates lower production costs in comparison with sales price and profitability levels of over 30%, the payment of royalties based on the maximum royalty rate of 3% kicks in. This differs from model 1, where the application of the maximum royalty rate kicks in from profitability level of about 56.5% (60%). Area B like Area A in Bradley's work represents realized beneficiation incentive.

In terms of value-added for refinement costs of 10%, 20% and 30% of sales price, the observations made are indicated in Figures 9.6 – 9.8.

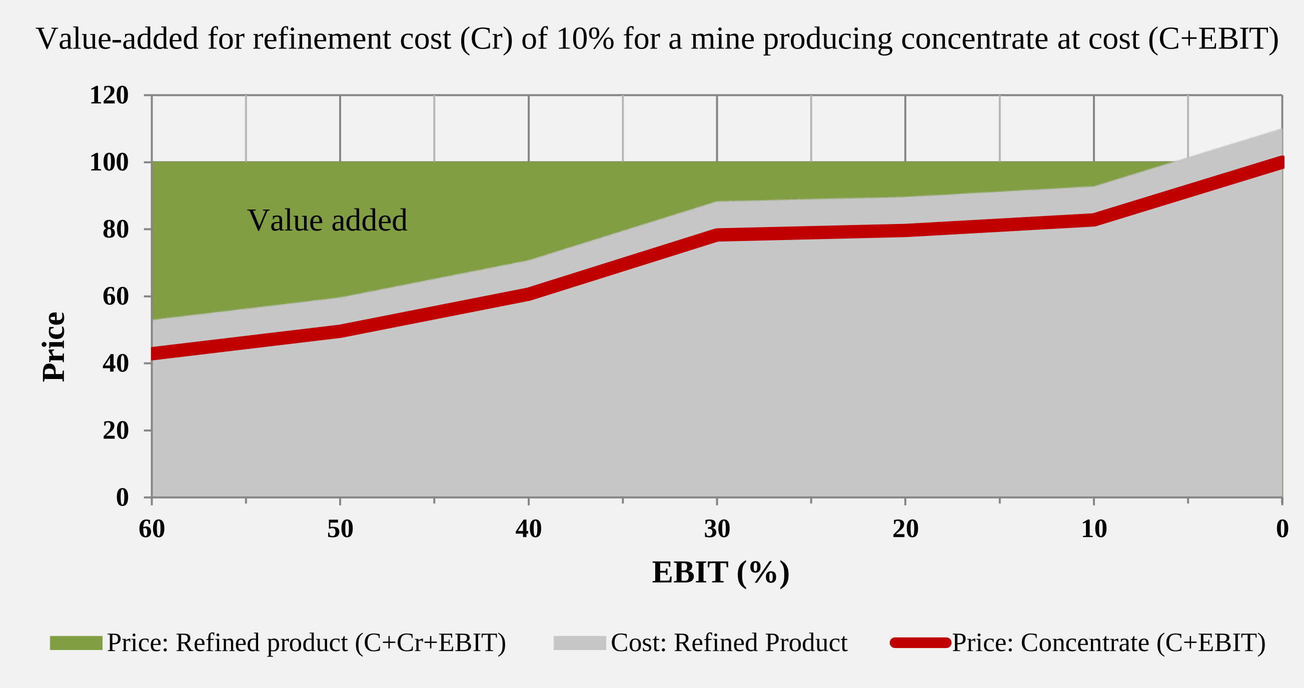

Figure 9.6: Value-added for refinement cost of 10% of sales price.

In the Figures 9.6 – 9.8, it can be seen that value-added diminishes as refinement cost increases from 10% to 20% to 30%. However, unlike in model 1, Value-add does not vanish when refinement cost is 30%.

At refinement cost of 10%, value-added portion begins from EBIT portion of sales price equalling about 5% and increases as the EBIT portion increases to 60% of sales price. At refinement cost of 10%, the size of the value-added portion when EBIT portion is between 5% and 20% is about 10% of sales price, which is similar to that of same EBIT portions in model 1. However, the size of the value-added portion when EBIT portion is 20% and above is considerably more significant than that of the same EBIT portions in model 1.

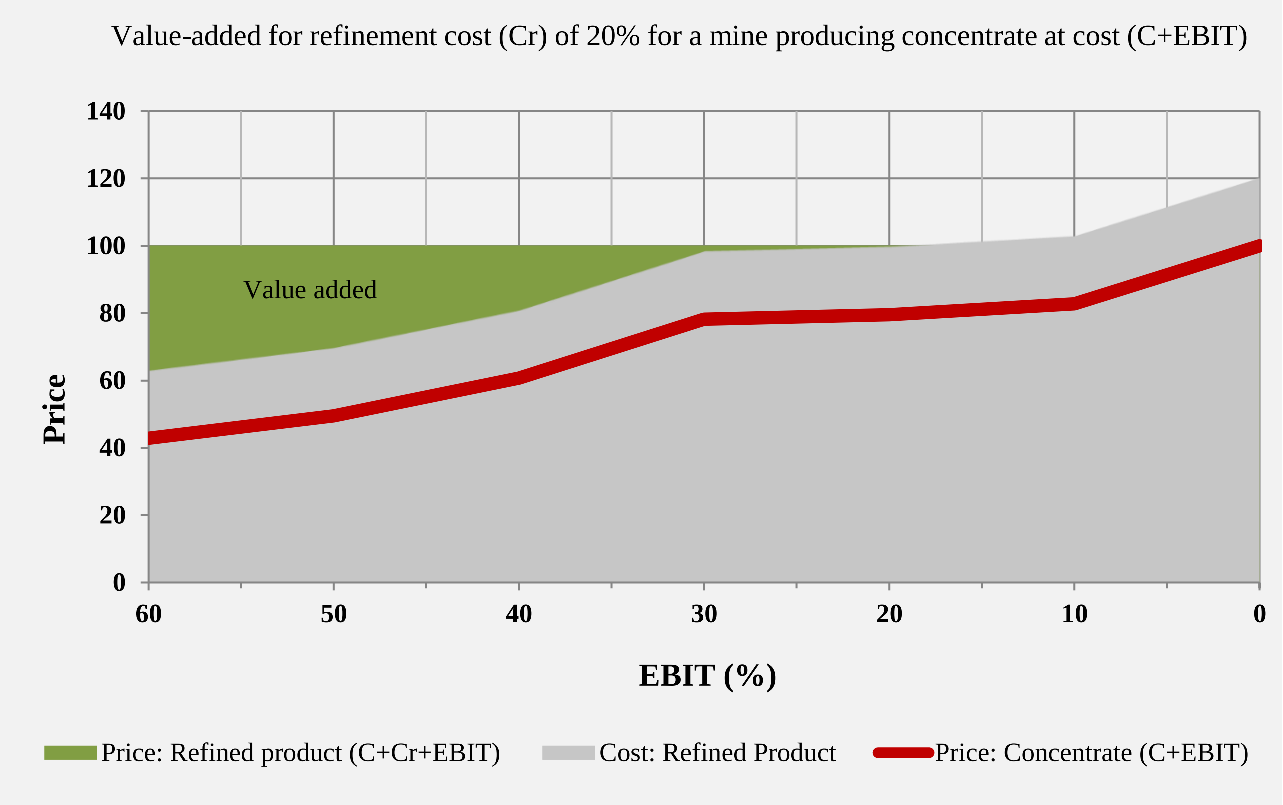

Figure 9.7: Value-added for refinement cost of 20% of sales price.

At refinement cost of 20%, value-added portion begins from EBIT portion of sales price equalling about 20% and increases as the EBIT portion increases to 60% of sales price. At refinement cost of 20%, the size of the value-added portion when EBIT portion is between 20% and 30% is about 5% of sales price. However, the size of the value-added portion when EBIT portion is 30% and above is considerably more significant than that of the same EBIT portions in model 1, whose size barely accounted for 5% of sales price.

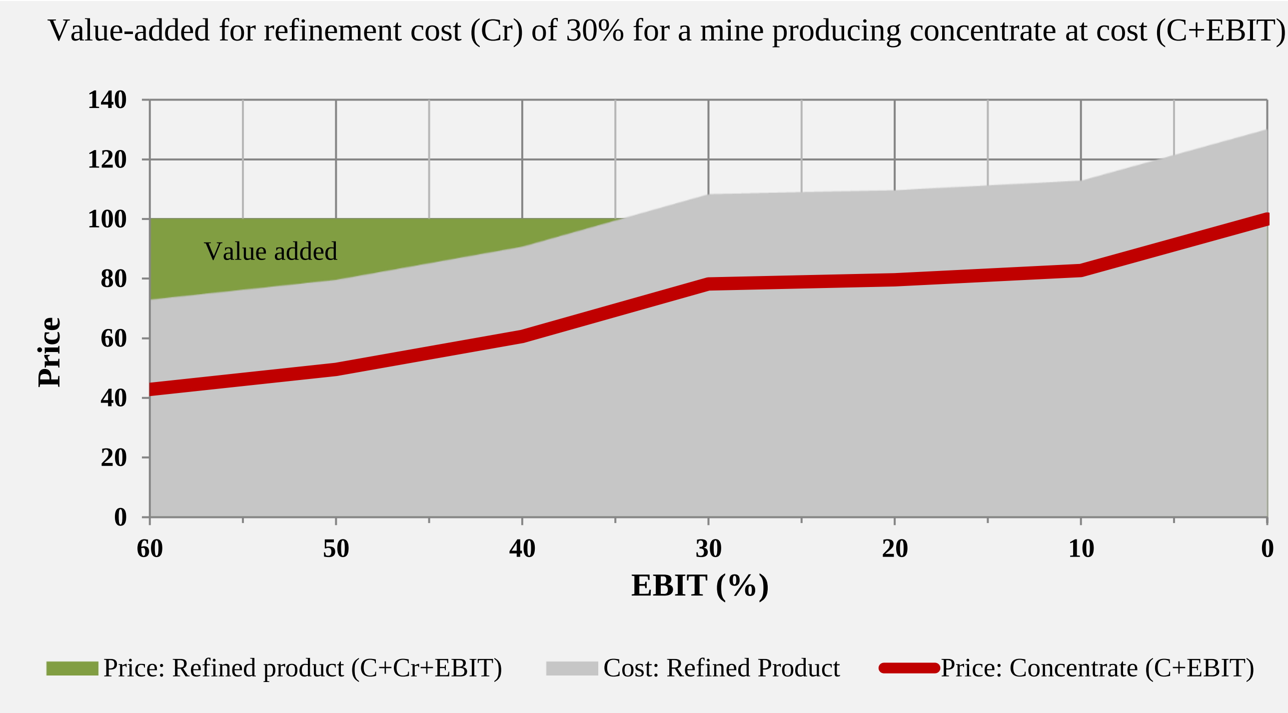

Figure 9.8: Value-added for refinement cost of 30% of sales price.

At refinement cost of 30%, value-added portion begins from EBIT portion of sales price equalling about 35% and increases as the EBIT portion increases to 60% of sales price. This differs from the observation in model 1, where value-added portion is non-existent when refinement cost is 30% and above.

9.2.3 Value-add assessment for Model 3

Model 3 retains the peculiarity of the SA royalty system, where there is a minimum (compulsory) royalty payment rate of 0.5%, however, instead of dual formulae being applied to both refined and unrefined minerals, only one royalty formula is used for both classes of mineral production. In model 3, the only applicable royalty formula for both classes of minerals is the current royalty formula for refined minerals, with none of its parameters being adjusted. Hence, Figure 9.9 illustrates the relationship between royalty rates and sales price for model 3.

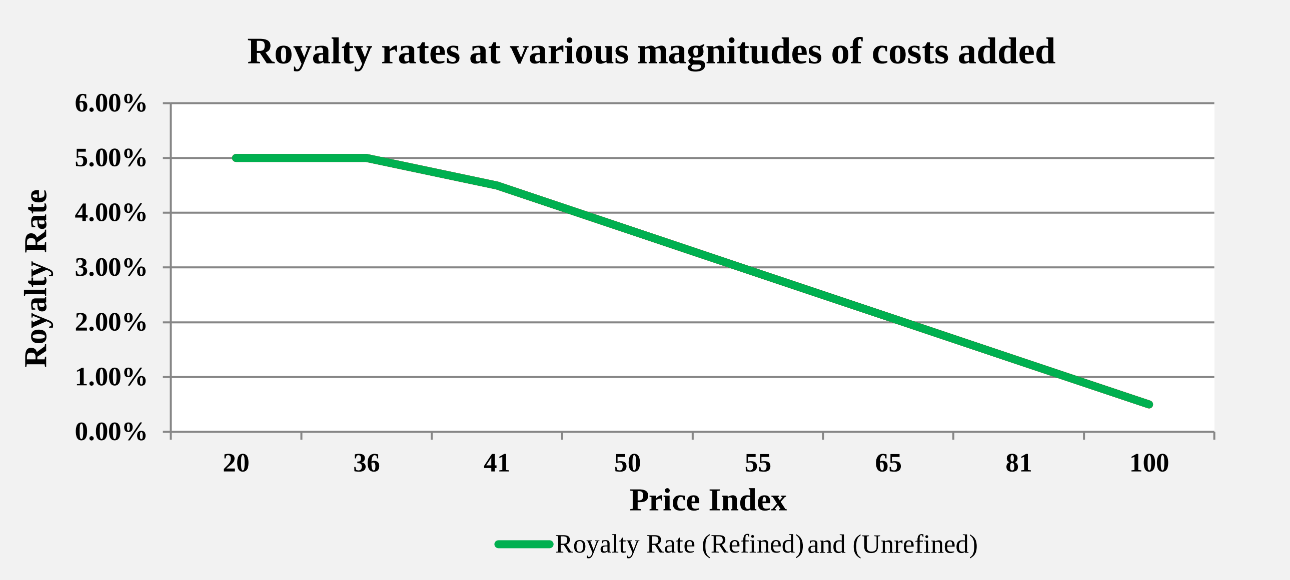

Figure 9.9: The relationship between royalty rates and sales price in terms of Model 3's specifications. Adapted from Cawood (2011a).

On the price index axis of the Figure 9.9, sales price for final product (either unrefined or refined final product) is a proxy for gross revenue and it consists of different proportions of production costs plus EBIT (profit). At the price index of 100, the proportion of production costs is equal to sales price received, implying that no profit was made. Therefore, the royalty rate of 0.5% is still paid by the producer at price index 100. Furthermore, the reduction in price indices indicates that the lower the price index, the lower the proportion of production costs in relation to sales price is, and inversely, the higher the EBIT portion. For both classes of mineral producers, it can be observed that from the price index of 36 and lesser, which indicates lower production costs in comparison with sales price and profitability levels of over 60%, the payment of royalties based on the maximum royalty rate of 5% kicks in. This differs from model 2, where the application of the maximum royalty rate kicks in from maximum profitability level of about 30%. In this model, Area B like Area A in Bradley's work representing realized beneficiation incentive does not exist.

In terms of the value-added assessment for refinement costs of 10%, 20% and 30% of sales price, this could not be carried out since there was no 'advantageous' and separate royalty formula with reduced royalty rate that was applicable to refined minerals in comparison with that applied to unrefined minerals. Hence, in terms of the modified version of the MPRRA provisions as specified by model 3 (which makes no 'special' beneficiation royalty formula allowances), there will be no value-added to the miner-turned-refiner as refinement cost increases from 10% to 20% to 30%. This is due to the fact that with both classes of mineral producers paying royalties using the same formula, the royalty formula is just a revenue and compensation collection instrument. Hence, the producer (irrespective of the class of mineral production) with the greater revenue, pays the greater royalties (based on his profitability).

9.2.4 Value-add assessment for Model 4.

Model 4 retains the peculiarity of the SA royalty system of consisting of a minimum (compulsory) royalty payment rate of 0.5%. However, instead of dual formulae being applied to both refined and unrefined minerals, only one royalty formula is used for both classes of mineral production. In this model, the only applicable royalty formula for both classes of minerals is the current royalty formula for unrefined minerals, with none of its parameters being adjusted. Hence, Figure 9.10 illustrates the relationship between royalty rates and sales price for model 4.

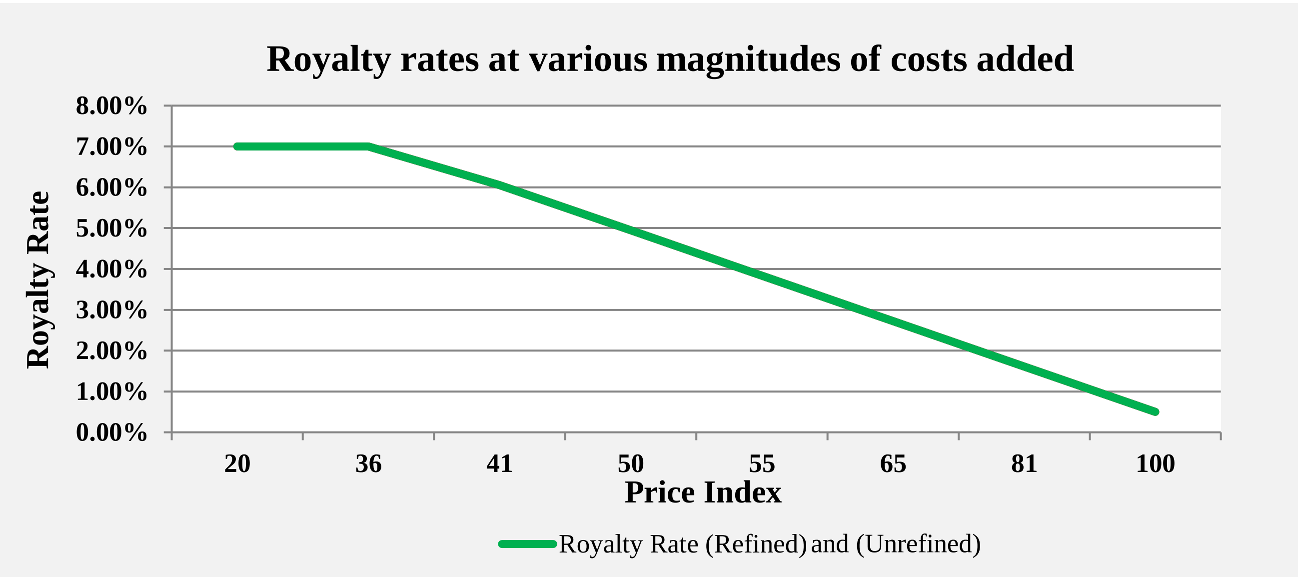

Figure 9.10: The relationship between royalty rates and sales price in terms of Model 4's specifications. Adapted from Cawood (2011a).

As with the description of the previous models, the price index axis of the Figure 9.10 represents sales price for final product (either unrefined or refined final product) being used as a proxy for gross revenue and it consists of different proportions of production costs plus EBIT (profit). At the price index of 100, the royalty rate of 0.5% is paid by the producer even though the proportion of production costs is equal to sales price received, implying that no profit was made at that price index. The reduction in price indices indicates that the lower the price index, the lower the proportion of production costs in relation to sales price is, and inversely, the higher the EBIT portion. Just as in the case of model 4, for both classes of mineral producers, it can be observed that from the price index of 36 and lesser, which indicates lower production costs in comparison with sales price and profitability levels of over 60%, the payment of royalties based on the maximum royalty rate of 7% kicks in. This differs from model 2, where the application of the maximum royalty rate kicks in from maximum profitability level of about 30%. Also, Area B like Area A in Bradley's work representing realized beneficiation incentive does not exist in this model.

In terms of the value-added assessment for refinement costs of 10%, 20% and 30% of sales price, this could not be carried out since there was no 'advantageous' and separate royalty formula with reduced royalty rate that is applicable to refined minerals in comparison with that applied to unrefined minerals. Hence, in terms of the modified version of the MPRRA provisions as specified by model 4 (which makes no 'special' beneficiation royalty formula allowances), there will be no value-added to the miner-turned-refiner as refinement cost increases from 10% to 20% to 30%, just like the case of model 3. This is due to the fact that with both classes of mineral producers paying royalties using the same formula, the royalty formula is just a revenue and compensation collection instrument. Hence, the producer (irrespective of the class of mineral production) with the greater revenue, pays the greater royalties (based on his profitability). However, the magnitude of royalty payments using this model's specifications is greater than that of model 3.

9.2.5 Value-add assessment for Model 5

Model 5 retains the peculiarity of the SA royalty system of consisting of a minimum (compulsory) royalty payment rate of 0.5%. However, instead of dual formulae being applied to both refined and unrefined minerals, only one royalty formula is used for both classes of mineral production. In this model, the only applicable royalty formula for both classes of minerals is a modified version of the current royalty formula for unrefined minerals, where F-factor is 4, the maximum X value for 'all' mineral producers would be 26% and maximum royalty rate remains 7%. Hence, Figure 9.11 illustrates the relationship between royalty rates and sales price for model 5.

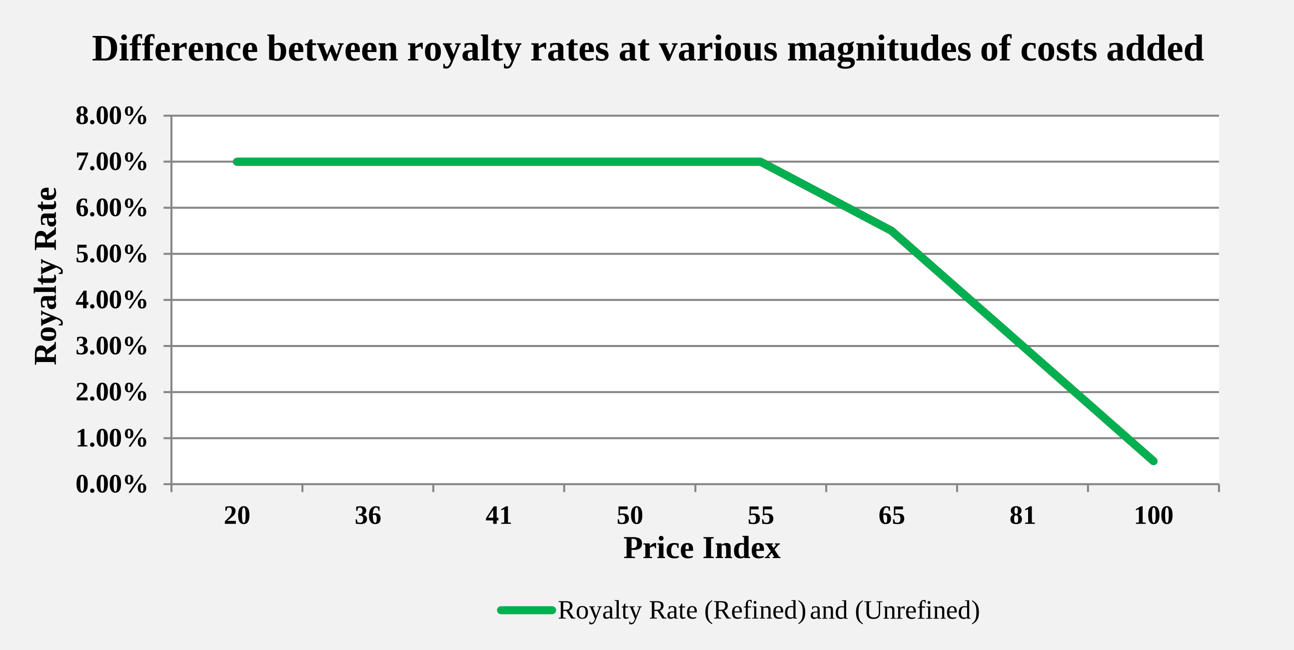

Figure 9.11: The relationship between royalty rates and sales price in terms of Model 5's specifications. Adapted from Cawood (2011a).

As with the description of the previous models, the price index axis of the Figure 9.11 represents sales price for final product (either unrefined or refined final product) being used as a proxy for gross revenue and it consists of different proportions of production costs plus EBIT (profit). At the price index of 100, the royalty rate of 0.5% is paid by the producer even though the proportion of production costs is equal to sales price received, implying that no profit was made at that price index. The reduction in price indices indicates that the lower the price index, the lower the proportion of production costs in relation to sales price is, and inversely, the higher the EBIT portion. In the case of model 5, for both classes of mineral producers, it can be observed that from the price index of 55 and lesser, which indicates lower production costs in comparison with sales price and profitability levels of over 26%, the payment of royalties based on the maximum royalty rate of 7% kicks in. This differs from models 1, 2, 3 and 4 where the application of the maximum royalty rate kicks in from maximum profitability levels of about 60%, 30%, 60% and 60% respectively. Also, Area B like Area A in Bradley's work representing realized beneficiation incentive does not exist in this model.

The value-added assessment for refinement costs of 10%, 20% and 30% of sales price could not be carried out since there was no 'advantageous' and separate royalty formula with reduced royalty rate that is applicable to refined minerals in comparison with that applied to unrefined minerals. Hence, in terms of the modified version of the MPRRA provisions as specified by model 6 (which makes no ‘special’ beneficiation royalty formula allowances), there will be no value-added to the miner-turned-refiner as refinement cost increases from 10% to 20% to 30%, just like the cases of models 3 and 4. This is due to the fact that with both classes of mineral producers paying royalties using the same formula, the royalty formula is just a revenue and compensation collection instrument. Hence, the producer (irrespective of the class of mineral production) with the greater revenue, pays the greater royalties (based on his profitability). Using this model’s specifications, the SA government is bound to glean a more significant magnitude of royalty payments than all other models, in terms of the amount of maximum royalty rate payers, due to the maximum profitability ratio of this model.

9.3 DISCUSSIONS OF THE VALUE-ADDED ASSESSMENT RESULTS OF THE FIVE MODELS.

Having assessed all the five policy options (i.e. five models) in terms the value that each model can add to the miner-turned-refiner as specified by Cawood’s 2011 and Bradley’s 1986 models, it is important to compare all their results against each other. This is for the purpose of further substantiating the most optimal policy option identified in chapter eight, bearing in mind the three main objectives of the Royalty Act.

Table 9.1 consists of the results from the value-added assessment of all five models, placed next to each other.

Table 9.1: Comparison of the value-added assessment results of all the six models for refinement costs of 10%, 20% and 30% of sales price.

Value-added assessment models	**Using both formulae in the current state**	**Using both formulae (with tweaked royalty formula for refined minerals having F = 12, max X = 30%, max royalty rate = 3%)**	**Using royalty formula for refined minerals only**	**Using royalty formula for unrefined minerals only**	**Using tweaked royalty formula for unrefined minerals only (with F = 4, max X = 26%, max royalty rate = 7%)**
Cawood's 2011 specifications	Realized beneficiation incentive (Area B): As the magnitude of cost of production decreased in comparison to EBIT, area B covered a size that represented the 2% difference between the maximum royalty rates applicable to refined and unrefined minerals in the current MPRR Act.	Realized beneficiation incentive (Area B): As the magnitude of cost of production decreased in comparison to EBIT, area B covered a size that represented the 4% difference between the maximum royalty rates applicable to refined and unrefined minerals in the current MPRR Act. In terms of size dimensions of its area B, it is pictorially evident that it is greater than that of	Realized beneficiation incentive (Area B): This was non-existent, as the same royalty formula was applicable to both refined and unrefined minerals.	Realized beneficiation incentive (Area B): This was non-existent, as the same royalty formula was applicable to both refined and unrefined minerals.	Realized beneficiation incentive (Area B): This was non-existent, as the same royalty formula was applicable to both refined and unrefined minerals.

Table 9.1: Comparison of the value-added assessment results of all the six models for refinement costs of 10%, 20% and 30% of sales price (*continued*).

		model 1.			
	Value-add at refinement cost of 10%: a. Value-added begins when EBIT is about 5% and increases up to EBIT of 60%. b. The size of the value-added portion when EBIT is between 5% and 60% represents about 10% to 20% of sales price.	Value-add at refinement cost of 10%: a. Value-added begins when EBIT is about 5% and increases up to EBIT of 60%. b. The size of the value-added portion when EBIT is between 5% and 60% represents about 10% to 50% of sales price.	Value-add at refinement cost of 10%: No value-added assessment was possible.	Value-add at refinement cost of 10%: No value-added assessment was possible.	Value-add at refinement cost of 10%: No value-added assessment was possible.
	Value-add at refinement cost of 20%: a. Value-added begins when EBIT is about 12% and increases up to EBIT of 60%.	Value-add at refinement cost of 20%: a. Value-added begins when EBIT is about 20% and increases up to EBIT of 60%.	Value-add at refinement cost of 20%: No value-added assessment was possible.	Value-add at refinement cost of 20%: No value-added assessment was possible.	Value-add at refinement cost of 20%: No value-added assessment was possible.

Table 9.1: Comparison of the value-added assessment results of all the six models for refinement costs of 10%, 20% and 30% of sales price (*continued*).

	b. The size of the value-added portion when EBIT is between 12% and 60% represents about 5% to less than 10% of sales price.	b. The size of the value-added portion when EBIT is between 20% and 60% represents about 5% to less than 40% of sales price.			
	Value-add at refinement cost of 30%: No value was/is added	Value-add at refinement cost of 30%: a. Value-added begins when EBIT is about 25% and increases up to EBIT of 60%. b. The size of the value-added portion when EBIT is between 35% and 60% represents about 5% to about 30% of sales price.	Value-add at refinement cost of 30%: No value-added assessment was possible.	Value-add at refinement cost of 30%: No value-added assessment was possible.	Value-add at refinement cost of 30%: No value-added assessment was possible.
	Value-add at refinement cost of 10%:	Value-add at refinement cost of 10%:	Value-add at refinement cost of 10%:	Value-add at refinement cost of 10%:	Value-add at refinement cost of 10%:

Table 9.1: Comparison of the value-added assessment results of all the six models for refinement costs of 10%, 20% and 30% of sales price (*continued*).

Bradley's 1986 specifications	The value-added portion that is 10% to 20% of sales price, is averagely twice of refinement cost of 10%. Hence, it fairly satisfies Bradley's recommendation.	The value-added portion that is about 10% to 50% of sales price, is more than twice of refinement cost of 10%. Hence, it satisfies Bradley's recommendation.	This does not satisfy Bradley's recommendation since, there was no value added.	This does not satisfy Bradley's recommendation since, there was no value added.	This does not satisfy Bradley's recommendation since, there was no value added.
	Value-add at refinement cost of 20%: The value-added portion that is about 5% to less than 10% of sales price is less than refinement cost of 20%. Hence, it does not satisfy Bradley's recommendation.	Value-add at refinement cost of 20%: The value-added portion that is 5% to less than 40% of sales price, is about twice of refinement cost of 20%. Hence, it satisfies Bradley's recommendation.	Value-add at refinement cost of 20%: This does not satisfy Bradley's recommendation since, there was no value added.	Value-add at refinement cost of 20%: This does not satisfy Bradley's recommendation since, there was no value added.	Value-add at refinement cost of 20%: This does not satisfy Bradley's recommendation since, there was no value added.
	Value-add at refinement cost of 30%: This does not satisfy Bradley's	Value-add at refinement cost of 30%: The value-added portion that is about 5% to about 30% of sales price is	Value-add at refinement cost of 30%: This does not satisfy Bradley's	Value-add at refinement cost of 30%: This does not satisfy Bradley's	Value-add at refinement cost of 30%: This does not satisfy Bradley's

Table 9.1: Comparison of the value-added assessment results of all the six models for refinement costs of 10%, 20% and 30% of sales price (*continued*).

	recommendation since, there was no value added.	almost the same size as the refinement cost of 30%. Hence, it does not satisfy Bradley's recommendation.	recommendation since, there was no value added.	recommendation since, there was no value added.	recommendation since, there was no value added.

From the table above, it can be clearly observed that of all the five models assessed in terms of Cawood and Bradley's model specifications/recommendations, model 2 stands out as the most satisfactory.

This further supports its choice as the most optimal policy option as deduced in chapter eight. It is therefore appropriate to recommend this option to the SA government, which would be outlined in an implementation plan in the next section.

9.4 PROPOSED IMPLEMENTATION PLAN

In the previous section, it was additionally deduced that model 2 was the most optimal instrument for providing more beneficiation incentives. This main beneficial option for the government specifies that:

If government decides to keep dual formulae and all three main policy objectives of the Act, it should use model 2. With this model, it should be prepared to receive lesser amounts of royalties from the refiners paying royalties based on the new reduced maximum royalty rate. However, a greater number of refiners would be paying royalties at maximum royalty rate because many of them would be able to achieve profitability ratios of 30% and above. This option provides the best win-win situation for both government and industry out of all the five models in an era where achieving more mineral beneficiation in SA is one of government's paramount objectives. This is because model 2 could potentially encourage miners to become refiners. However, government would need to upgrade its capacity of handling the complexities associated with using the dual formulae.

In light of the above beneficial option, if government wants to keep all three main objectives of the MPRRA, it is possible to actually achieve such win-win situation. This can be realized by using the tweaked version of the current MPRRA's formula for refined minerals (with lower max profitability ratio of 30% and lower max royalty rate of 3%) for between 10 to 15 years, so as to encourage more miners to become refiners and/or encourage the establishment of more refiners (with miners-only paying royalties based on current formula for unrefined minerals). After the government is satisfied with the level of beneficiation, it can then change royalty payment terms to be charged based on model 5 (where lower max profitability ratio is 26% and max royalty rate is 7%), at a much later stage. Even with the use of model 5, refiners can realize beneficiation incentive as compared to miners-only if the royalty rate is applied to a royalty base that allows for more refining/beneficiation costs to be deducted. This would further encourage the establishment of more refining/beneficiation facilities in SA.

To effectively make this change to the current MPRRA, the recommended implementation plan has to be presented to SA's National Treasury for ratification. The process of ratifying this implementation is outlined hereinafter.

9.4.1 Who is National Treasury?

The National Treasury is the SA government department that is responsible for managing South Africa's national government finances, national economic policy and preparing the annual national budget (National Treasury (2), n.d.; Brand South Africa, 2016). This department's mission is "to promote economic development, good governance, social progress and rising living standards through accountable, economic, efficient, equitable and sustainable management of South Africa's public finances (Yes Media, 2018). As highlighted in National Treasury (3) (n.d.), the executive and Parliament mandates the National Treasury to "continue to support the optimal allocation and utilisation of financial resources in all spheres of government to reduce poverty and vulnerability among South Africa's most marginalised".

Its mandated role and responsibilities are defined by the Constitution of the Republic (Chapter 13) and in the Public Finance Management Act (Chapter 2). These roles and responsibilities include:

1. the management of government expenditure;
2. acting as a banker for national government departments by setting and maintaining financial management norms and standards for the departments, determining macro limits on their expenditure in line with affordability and sustainability of services, as well as monitoring their performance and reporting any deviations to the Auditor-General;
3. setting treasury norms and standards to ensure transparency and expenditure control in every sphere of government;
4. overseeing logistical control of stocks and assets;
5. Promotion of government's fiscal policy framework;
6. coordinating and supporting government's macro-economic policy and intergovernmental financial relations;
7. management of the budget preparation process;
8. facilitating the Division of Revenue Act, which provides for an equitable distribution of nationally raised revenue between national, provincial and local government; and
9. Monitoring the implementation of provincial budgets (Brand South Africa, 2016; National Treasury (3), n.d.).

NT department falls under the portfolio of the Minister of Finance, just like the South African Revenue Service and Statistics South Africa (Brand South Africa, 2016). The organizational structure of NT is outlined in Figure 9.12:

NATIONAL TREASURY ORGANOGRAM

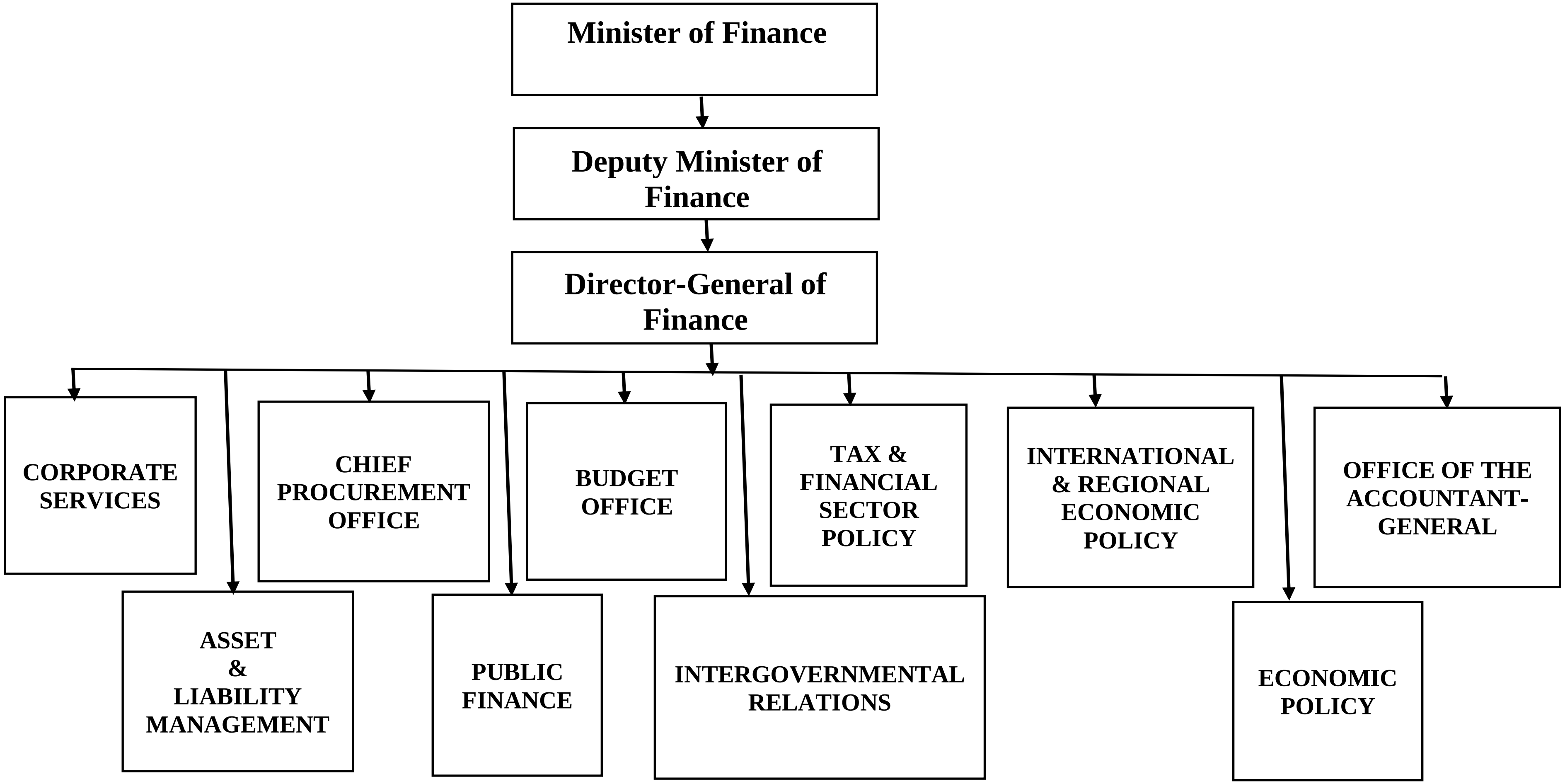

Figure 9.12: National Treasury's organizational structure. Adapted from Hadebe (2006) and National Treasury (4) (n.d.).

9.4.2 Procedure for implementation of the proposed tweaked version of MPRRA

With one of NT's priorities over the next 10 years being to increase investment in infrastructure and industrial capital, this study's main beneficial policy option of tweaking the current MPPRA that has the potential to promote the realization of more mineral value-addition in SA vis-à-vis industrialization, can facilitate this priority. Hence, it is appropriate for the Department to consider this proposition.

Knowing that the realization of more mineral value-addition in SA is not only dependent on the presence of royalty instrument's beneficiation incentives, for NT to consider and effectively use this recommendation, there are procedures/processes that need to be followed. The components of the procedure/process can ensue based on the following:

1. Policy amendment proposal to be presented to the National Treasury. The Implementation plan that highlights the proposed MPRRA amendment, which consists of the proposed amendment, supporting activities, timeframe and outcomes is outlined in Table 9.2.
2. Liaison with active participants: NT's Minister, Deputy Minister, Director-General and office of Tax and Financial Sector Policy — Parliament, Cabinet, Portfolio committee — DMR, SARS, Mining and Refining companies and other mining stakeholders.
3. Law-amendment process to modify the necessary part of MPRRA, which is section 4(1), as illustrated in Figure 9.13 commences.

Table 9.2: Proposed implementation plan for the use of the main optimal version of the MPRRA.

Selected modified MPRRA policy option.	Supporting activities	Timeframe	Outcomes
Keeping all three main objectives of MPRRA, SA government should modify the parameters of the current formula for refined minerals only, as follows: $R\% = 0.5\% + (\frac{30}{F})\%$ Where, Max royalty rate (R%) = 3%; Max profitability ratio (X) = 30%; Minimum royalty rate = 0.5%; and F = 12.	1. Provision of more cost competitive, efficient and improved infrastructure needed to facilitate mineral value-addition. 2. Continuous investment in establishment and strengthening of new and already-existing educational institutions for training and producing skilled labour in engineering, scientific and technical services. 3. Channelling of more resources to support innovation, research and development. 4. The realization of regulatory provisions and specifications of	Medium term of between 10 and 15 years.	1. More miners-only would have been encouraged and adequately facilitated to becoming miners-and-refiners. 2. There would be establishment of more globally competitive refining and mineral value-addition facilities and centres in SA.

Table 9.2: Proposed implementation plan for the use of the main optimal version of the MPRRA (*continued*).

	other value-addition related policies that would guarantee access to raw materials at sustainable developmental prices. 5. Intensification of the integration of value-addition related activities and policies of all the government departments associated with mineral beneficiation and industrialization. 6. Actualization of the initiatives that address the market barriers for SA's refined mineral products. 7. Creation of SWF from revenues collected by MPRRA.		

Table 9.2: Proposed implementation plan for the use of the main optimal version of the MPRRA (*continued*).

	8. Training of NT and SARS personnel to handle the complexities of the royalty calculations based on the dual formulae. 9. Continuous monitory of industry's progress in contributing to government's local beneficiation objectives.		

3. Law-amendment process to modify necessary part of MPRRA legislation

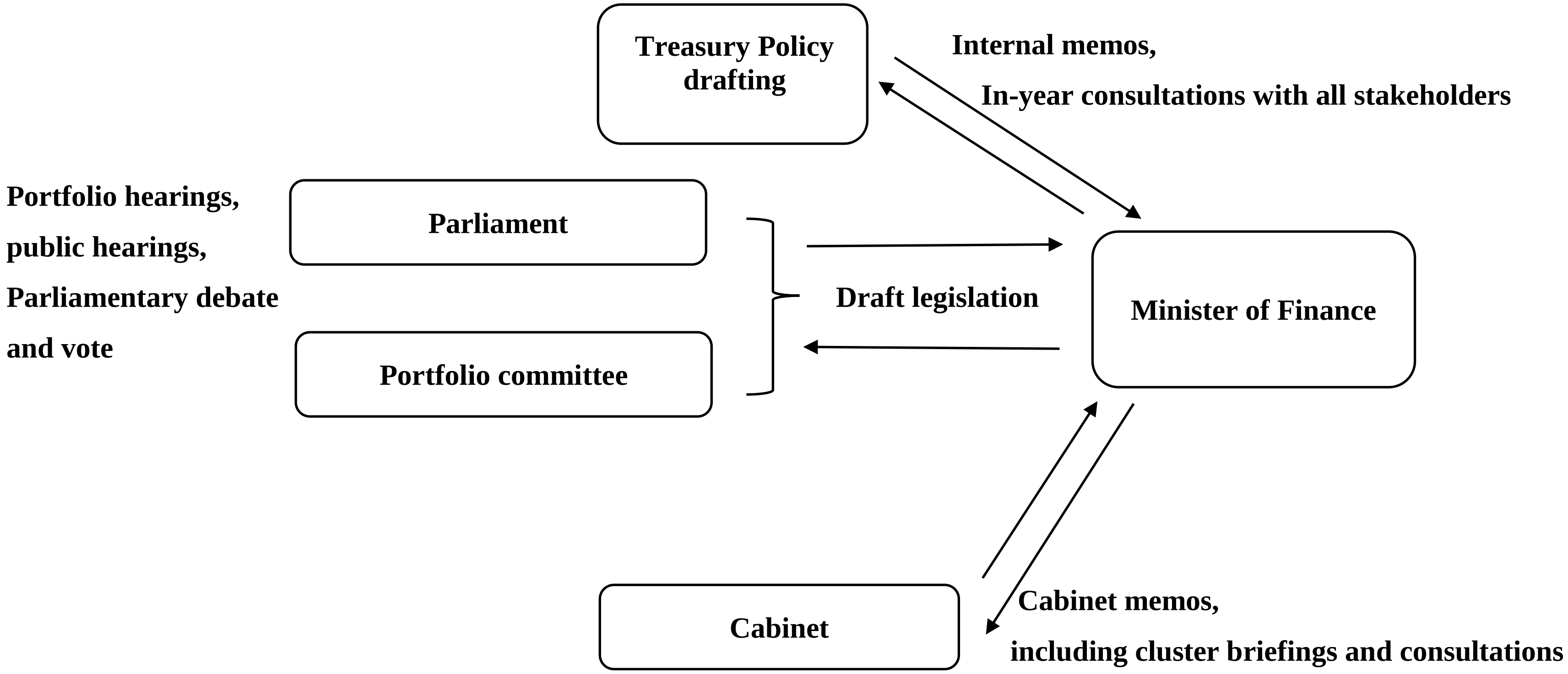

Figure 9.13: Law-amendment process to bring the MPRRA proposed amendment into effective use. Source: Roux (2017).

9.5 CONCLUSION

In this chapter, it was further established that in the era where the priority of realizing more mineral value-addition in SA is more critical, the most beneficial and optimal policy option for tweaking the current MPPRA would be the use of model 2. Forthwith, the outlay of how this beneficial modified version of the MPRRA should be presented and effected by NT was outlined in an implementation plan and procedure in this chapter.

The next chapter would consist of the summary of all the findings of this research and the statement of the conclusions drawn that answer the question raised in this research. Some recommendations will be given to propose areas of further research needed to ensure that the beneficiation objective of the SA government can be realized.

CHAPTER TEN

CONCLUSION AND RECOMMENDATION.

As part of expressing RN in the current era, the drive amongst many mineral-rich developing countries has been to progressively work towards ensuring that their resources are optimally used and managed. This drive for more optimal use of mineral resources is for the purpose of yielding more long-term benefits for their States and citizens. This drive that is being pursued by these countries has been more in line with the realization of more linkages from their mineral sector to other economic sectors of their economy. In emulating the developmental paths taken by many currently developed countries, these developing countries are enabling many of their different policy instruments to facilitate the convertion of their comparative advantage (mineral resources) into competive advantage (industrialization) in particular. With South Africa not being left out of this move, its policy-makers have been increasingly revising and designing various fiscal, industrial and regulatory policies to ensure optimal use and management of its mineral resources.

As part of these resource-based industrialization facilitation policy reforms in South Africa, the MPRRA was promulgated as a means of enabling the mineral sector to facilitate the diversification of SA's economy (Oshokoya, 2012). With one of the main objectives of the MPRRA being to provide incentives that would encourage the existence of more refining facilities from extractive ones, the 2012 study found that such incentive was almost non-existent. However, through another scenario analysis conducted in that study, it was realized that the MPRRA had the possiblity of providing more beneficiation incentives under 'special' conditions. The recommendation to explore this possibility informed the focus of this current study.

Hence, this research involved assessing whether the conclusion of the 2012 study as regards applying the MPRRoyalty regime's beneficiation provisions to other commodity sectors including PGM sector would be the same. The PGM sector as well as three other commodity sectors – gold, coal, iron ore – were used for this current study's assessment so as to answer its research questions.

The next section comprises of the summary of all findings obtained in order to answer the research questions of this study.

10.1 SUMMARY OF FINDINGS

10.1.1 Chapter One Research background and aims of research

In this chapter, it was highlighted that the drive for RN and economic diversification from resource-dependency formed the main context on which this research was based. It was indicated that the main focus of this research would involve exploring ways of adjusting the parameters of SA's mining royalty regime, in order to realize a system that allows for optimal mineral resource use and management of mineral resources rents. Furthermore, this chapter referred to some previous studies (Oshokoya's 2012 study, SIMS report, Cawood and Oshokoya's 2013 study) concerned with realizing more benefits for SA citizens as well as economic linkages from SA's mineral sector, as contributory motivation to carry out this research.

The chapter also provided an overview of the potential ability of the mineral sector to contribute to industrialization of its host States. The status of South Africa's beneficiation industrial drive was discussed, indicating that although some mineral value-addition was already occurring in SA, the government's goal was to increase the amount of this value-addition. This goal is aimed at obtaining maximal benefits for its economy from its mineral endowments. The critical research gaps of lack of mineral fiscal instruments in mineral-rich developing countries to facilitate the establishment of economic linkages as well as lack of favourable systems for the management of mineral rents issues were identified. Hence, the chapter signified that the study aimed at addressing these critical gaps by using the case of tweaking fiscal instruments such as the MPRRA so that it results in optimal and efficient delivery of benefits and maximum long-term economic development to SA.

10.1.2 Chapter Two Resource Nationalism, its modes of expression and its connection with optimal mineral use and revenue management.

Before delving into modifying one of the instruments that has been put in place to yield expected significant results of RN in SA, it was considered important to first understand what the RN concept meant. Hence, this chapter provided insight into the RN ideology that resulted from the drive of States wanting to maximally benefit from their resource endowments, as well as the historical background that led to RN concerns in developing countries especially SA. The different forms of expression of RN overtime were expounded on in this chapter.

It was highlighted that in the present epoch in history, RN drive has become more important and gained momentum globally, just like in the post-colonial era. However, RN is being expressed quite differently today as compared to the 1960s. This is because the RN drive presently is influenced by more factors than in the 1960s. Additionally, it was shown that the mode of expressing RN has a range of options available; with extreme variations existing at opposite ends. It was indicated that although RN was generally misconstrued as resource nationalization, the two words did not actually mean the same thing. It was presented that resource nationalization is just an extreme variation of expressing RN. It was mentioned that on examining the impact of nationalization through case studies, varied results were obtained. This was because many other factors peculiar to each country have contributed to the realization of successful or unsuccessful nationalization stories.

Furthermore, resource privatization was illustrated as another means by which countries express RN. It was presented that some governments choose this mode of RN expression from the onset of the discovery of mineral resources or after a period of mixed results (mostly failed) of nationalizing their mineral industries. Proponents of this RN mode prefer it because they argue that it allows for more efficient economic policies and resource management. In assessing its impact, empirical experience indicated that there are few success stories of nationalization as compared to privatization strategies. Additionally, the general use of a combination of licence conditions and taxation of the industry by governments that choose the path of the privatization mode of expressing RN, was discussed.

Furthermore, how RN links with the promotion of optimal mineral use (linkage creation), industrialization and economic development, were discussed in detail in this chapter. This led to expounding on another concept – Developmental State, which some countries have chosen as their means of expressing RN. The concept of economic linkage development from the mineral sector as well as the different types economic linkages that exist, were discussed.

With respect to the discussion of optimal mineral resource rent management in this chapter, it was indicated that the reliance of host States on fluctuating resource revenues has tended to be more harmful to the distributional needs of government expenditures, especially their poor citizens. It was therefore stated that it was necessary for governments to structure their fiscal systems to take into consideration the peculiarities affecting the fiscal flows of the mining business. It was also stated that governments should address mishandling of windfall opportunities from mineral development and save their commodity export receipts to increase productive investment. In conclusion, it was suggested that mineral-rich States should pursue the macroeconomic models of most of the oil-rich Middle Eastern nations, which involves the ownership of substantial sovereign wealth funds. These SWFs are government-sponsored investment vehicles generated principally from substantial cash surpluses from State investment during oil booms and/or mineral resources sector profits.

10.1.3 Chapter Three Expression of Resource Nationalism in mineral-rich Sub-Saharan Africa States: The drive to embark on local mineral value-addition.

This chapter involved narrowing down the RN discussion into highlighting its expression in mineral-rich States of Sub-Saharan Africa, with further specification on what obtains in SA. It also consisted of an extensive discussion on the argument of reduced 'terms of trade' for primary products over the past century. It was highlighted that this argument appears to be a major driving force that is causing mineral-rich SSA countries to embark on local mineral value-addition, as one of the 'compulsory' routes for these countries to take in order to realize industrialization in their jurisdictions. After analysing all sides of the terms of trade argument, the final suggestion to mineral rich SSA States was that they develop industries that can produce manufactured goods that are characterized by rising prices (beneficiation industries) but should not neglect primary production altogether. It was further suggested that these countries should invest in educating more people to be able to work in both sectors.

The case for linkage development from mineral sector within SSA mineral-rich economies (especially forward linkages) was also expounded in this chapter. It was found that domestic policies are great influences on the structure and ability of their mining industry to facilitate economic diversification within their States. Furthermore, a number of constraints to the realization of linkage development in many SSA countries as well as the critical determinants of the advancement of the nature and extent of domestic linkage in these countries were identified and discussed. In conclusion, it was highlighted that many SSA governments are increasingly instituting policies that would promote economic diversification, through the extension of backward, forward (and other economic) linkages to and from their mineral and/or oil sectors. However, their focus is currently much more on increasing the levels of forward linkages, as it appears that there have been more success levels with backward linkages unlike forward linkages.

10.1.4 Chapter Four Overview of South Africa's beneficiation policies and strategies.

This chapter discussed the 'terms of trade' and linkage development arguments with special focal reference to South Africa. Dating back from pre-colonization era, post-world war II, apartheid, democracy to 2000s era, this chapter gave details on the RN drive in SA and the supporting instruments that have been put in place to achieve industrialization of SA based on its RN claims. Some of SA's linkage development policies, especially with respect to facilitating forward linkages – mineral beneficiation, were discussed. Extensive referral was made to the serious 'nationalisation of mines and other industries' debate that was stirred up in the country, which was a notion promoted by the Youth League arm of the ruling party – ANC (ANC Youth League). Their nationalisation proposition was the way they expected SA to express RN, as the rise of the RN concept caused the battle between nationalism and capital to persist. With their proposition rendering a major disincentive to investment in SA's mining sector and economy in general, various intensive research and studies were carried out in order to correctly address and sanitize the debate. One of such studies included the SIMS study by the ANC in 2012. That study assessed what the role of the state in the South African economy was to be as well as the fiscal risks or benefits of nationalisation, amongst other things. It was stated in this chapter that the findings of the studies that facilitated the nationalisation debate showed that the pro-nationalisation argument did not appear to fully take into consideration several externalities.

Furthermore, the developmental State role that the South African government has played in the economic development of its jurisdiction was elaborated on in the chapter. It was highlighted that SA has had a significant history of being a developmental State. With the positive case for the occurrence of increased value-addition to mineral endowments within SA being emphasized, it was indicated that this presents another critical opportunity for the State to play its developmental role. Against this backdrop, some of the policies, legislation and incentives that the SA government (in its capacity as a developmental State) has enacted to show its commitment to the promotion of local mineral beneficiation, were identified and reviewed. From the review, the conclusion was that based on the number of the beneficiation policy instruments instituted by the government as well as the frequency of their release within about 20 years, its keen expression of realizing resource-based industrialization within the country is evident.

10.1.5 Chapter Five Expounding on the MPRRA beneficiation policy intent and research methodology.

In line with the objective of this research, it was deemed necessary not only to identify the mineral beneficiation-related policy instruments in SA but also to evaluate their effectiveness in order to contribute to achieving better results in terms of greater local mineral beneficiation. On this basis, this chapter singled out the MPRRA policy instrument for the in-depth evaluation of the effectiveness of the various mineral beneficiation-related policies in SA. The purpose of the evaluation was to highlight which of its parameters could be readjusted/modified to effectively realize the intended goals.

Before the evaluation was carried out, the objectives, structure, design parameters and application of the MPRRA in terms of facilitating the beneficiation goals of SA, were discussed in detail in this chapter. Some of the amendments to the Act and scepticism expressed towards the beneficiation intents of the Act and MPRDA section 26 amendment (as part of government's broad value-addition goal) were also highlighted.

Furthermore, with the 'problematics' of the Act informing the rationale for the continuation/extension of a previous study evaluating the MPRRA's beneficiation provisions carried out by Oshokoya in 2012, the methodology employed for this current research was expounded in detail in this chapter. The goal of the application of this methodology, which was split into two econometric analytic phases, was for the proposition of 'pragmatic' and 'realistic' solutions/adjustments needed to tweak the royalty regime. The specific details of how the econometric analysis of this study was modified to differ from that of 2012's study were also presented.

10.1.6 Chapter Six Commodity sector case studies: Selection criteria and justification for the selection of the sectors.

In this chapter, it was highlighted that before the methodologies mentioned in the previous chapter could be applied, it was important to identify the commodity sectors from which data would be obtained for application of the methodologies thereof. Hence, this chapter consisted of the identification of the commodity sectors chosen as suitable case studies for assessing whether the MPRRA's beneficiation provisions can sufficiently motivate miners to become refiners. The selection criteria used to choose these sectors were highlighted, which consisted of four different factors. Based on these criteria, the commodity sectors chosen for this research's analysis were gold, PGMs, iron ore and coal sectors. A moderate number of commodity sectors were chosen as suitable proxies for the 'entire' minerals industry of SA in order to suit research scope.

Additionally, justification for the choice of these commodities sectors were discussed in detail.

Additionally, a detailed overview of each of the commodity sectors was provided. The overviews emphasized the significance of their uses, the critical contribution that these sectors have made to SA economy in the past, present and future potential as well as their ability to be classified in dual states of refinement. It was found that all these sectors comprised of minerals and metals of the future. The details of the companies that were particularly selected from players in each of the four commodity sectors as suitable proxies, were also provided.

10.1.7 Chapter Seven Application of econometric analysis to commodity sector case studies and analysis of the results and observations from the case studies.

After specifying the companies whose financial data were found to be suitable proxies for the four commodity sectors, this chapter consisted of applying the methodology of this research to their financial data. The assessment was carried out to ascertain whether sufficient value (Realized beneficiation incentive) accrued to the producer that adds-on mineral processing facilities, in comparison to the miners-only. The expectation was the establishment of whether such value-add was/is sufficient enough to inspire miners to upgrade to become refiners.

However, before the method was applied, the description of the data/information obtained per commodity sector and the assumptions thereof were provided. This chapter consisted of the results of the assessments carried out to determine whether the difference between the royalty payments made by the refiners and miners-only in each commodity sector was statistically significant. The assessment carried out in this chapter was termed as Model 1. The findings of the model 1's assessment in terms of realized beneficiation incentive was that only the Steel_Iron ore sector appeared to obtain this incentive. However, for all the other sectors assessed (except the peculiar case of gold), the dual royalty formula showed mixed performance in terms of realized beneficiation incentive. The mixed performance leaned more towards the non-existence of any realized beneficiation incentive for the refiner, as the refiner paid more royalties than the miner-only in majority of the years assessed. Hence, the inference was that the royalty formula is at best a revenue-generating and rent-capturing instrument.

The results from model 1's assessment gave birth to several policy options available to the government to explore for tweaking the royalty formulae. As in the case of model 1, it was concluded that these different policy options had to be tested as per the procedures of the two econometric assessment phases. Their results also had to be weighed against each other in order to determine the most optimal royalty regime choice for the government.

10.1.8 Chapter Eight Re-construction of MPRRA's structure for provision of more optimal beneficiation incentives based on Policy options two to five.

In this chapter, the additional policy options highlighted in chapter seven were explored and tested. Policy option two was referred to as model 2 and tested in this chapter. Policy option three was referred to as model 3, policy option four was referred to as model 4 and policy option five was referred to as model 5.

Based on the policy objective of incentivising refiners, policy option two involved tweaking only the royalty formula for refined minerals, while leaving the royalty formula for unrefined minerals unchanged. However, before statistical tests were carried out on this option, different aspects/parameters of the royalty formula for refined minerals that could yield more realized beneficiation incentive, were investigated. These parameters included profitability ratios, F-factor and maximum royalty rates. Different assessments of the tweaked versions of these parameters were compared against each other in order to determine the optimal profitability ratio or maximum royalty rate for the formula to be tweaked by. Eventually, the maximum royalty rate selection of 3% was settled for. This final selection of maximum royalty rate yielded the possibility for tweaking the formula, which was termed as Model 2. Model 2 specified a maximum royalty rate of 3%, minimum royalty rate of 0.5% and F-factor of 12, with a maximum profitability ratio for refined mineral production of 30%.

From model 2's assessment, it was observed that the application of the dual royalty formula showed mixed performance for all other sectors assessed with respect to realized beneficiation incentive. This observation was similar to that of model 1, in which the mixed performance tended more towards the non-existence of any realized beneficiation incentive for the refiner, as the refiner paid more royalties than the miner-only in majority of the years assessed. The Steel_Iron ore sector was the only sector that appeared to obtain these savings, just like in model 1. Nevertheless, the royalty burden on the refiner in model 2 was much less than that of model 1. Therefore, in terms of providing more beneficiation incentives, model 2 was shown to realize this than model 1. At that stage, it appeared that model 2 (out of the two models (1 and 2) that had been tested) was the most optimal instrument for providing more beneficiation incentives.

However, in order to determine whether the above deduction could be accepted as the overall conclusion of this research, it was important to test the other policy options mentioned in in section 7.3.2 of chapter seven (options three, four and five). These assessments were also carried out in this chapter. Policy options three and four prescribed that the government charges royalties using only either one of the current royalty formulae. The implication of this being that the current beneficiation intent of the Act would have to be forfeited. It was identified that the choice of either of these options (referred to as models 3 and 4) potentially had both positive and negative connotations for both government and investors. Hence, to fruitfully establish their impacts, the models were tested just like the other models (options).

In model 3, only the current formula for refined minerals was applied to financial information of the two classes of producers in each commodity sector, with none of the formula's parameters being changed in its application. From the assessment carried out on model 3, it was found that even though there were no realized beneficiation incentive accruing to the refiner in general, the magnitude of the royalty burden on the refiner was more than that of model 2 but the same as model 1. Conversely, the royalty burden on the miner-only was less than that of models 1 and 2. In the case of the assessment carried out on model 4, it was found that even though there were no realized beneficiation incentive accruing to the refiner in general, the magnitude of the royalty burden on the refiner was more than that of models 1 to 3. Contrariwise, the royalty burden on the miner-only remained the same as in models 1 to 3.

Policy option five prescribed that the government charges royalties using only a modified version of the current royalty formula for unrefined minerals. Just like with policy options three and four, the implication of using policy option five would be that the current beneficiation intent of the Act would have to be forfeited. Hence, to fruitfully establish the option's impacts, the parameters of the current formula for unrefined minerals were adjusted and referred to as model 5. The model was then tested just like the other models (options). From model 5, it was also discovered that no realized beneficiation incentive accrued to the refiner generally. Furthermore, the magnitude of the royalty burden on both classes of producers was found to be more than that of models 1 to 4. This increase in magnitude pf royalty burden was due to the lower profitability ratio and maximum royalty rate parameters of model 5.

After all the five policy options had been tested, the magnitude effect of the differences between the royalties paid by the refined and unrefined mineral producers of all the models, were compared against each other. Also, a comparison between the deductions from each model's assessment was done to measure their impacts from the perspectives of both government and mining companies/investors. These comparisons were conducted for identifying the most optimal policy option, bearing in mind the three main objectives of the Royalty Act, but more especially with regards to tweaking the royalty formulae. From the results obtained in the comparisons between the five models, three main beneficial options for the government were realized. These are:

1. If the most important purpose of the mineral royalty is to receive rent, the government should leave the royalty system as it is currently (i.e. Policy option one);

2. If the most important purpose of the mineral royalty is to maintain all three main policy objectives of the Act, the government should keep the dual formulae

system but use the tweaked formula for refined minerals as specified by Model 2; but

3. If the most important purpose of the mineral royalty is to earn much more compensatory revenues and rent, the government can decide to charge royalties using only one formula – tweaked formula for unrefined minerals, as specified by model 5. This option would imply a de-linkage of the beneficiation objective from the MPRRA instrument.

With these three beneficial policy options, it was found that government had the potential of actually achieving a win-win situation if it planned on keeping all three main objectives of the MPRRA. This could be realized by combining the use of these beneficial policy options, in different timeframes/phases. Apart from the continual usage of the current MPRRA, the outplay of the use of the other two policy options in two phases was outlined in a proposed implementation plan in the next chapter.

10.1.9 Chapter Nine Deduction of the most optimal policy option and proposed implementation plan.

In this era, where the realization of more mineral value-addition in SA is highly crucial, the use of model 2 stood out as being the most optimal and beneficial policy option in previous chapter. Hence, this chapter involved additional assessments of all the five policy options in order to further substantiate this choice of optimal policy option.

This chapter's assessment of all the five policy options involved the determination of the value that each model could add based on different proportions of refinement cost (as a percentage of sales price), using Cawood's 2011 model[249] (specified in Chapter 1). As previously discussed in chapter 1, different levels of combined cost of concentrate plus target EBIT magnitudes and different proportions of refinement costs were varied in Cawood's 2011 model. Observations were then made at refinement costs of 10%, 20% and 30% of sales price. After these assessments were carried out, it was

[249] This assessment is based on the work carried out by Cawood (2011b) in which he sought to check the effect that different proportions of refinement cost (as a percentage of sales price) has in terms of value-added (as deduced from Bradley's 1986 model) in the context of the peculiar provisions of the MPRRA.

clearly observed that of all the five models assessed in terms of Cawood and Bradley's model specifications/recommendations, model 2 stood out as the most satisfactory. This further supported the choice of model 2 as the most optimal policy option that was deduced in chapter eight.

Furthermore, it was indicated in this chapter the necessity and appropriateness of recommending this option to the SA government. Hence, this chapter additionally outlined how this beneficial modified version of the MPRRA (using model 2) should be brought into effect by the SA government in an implementation plan.

10.2 CONCLUSION

This study has shown that one of the South African government's plans to facilitate the establishment of more beneficiating companies/projects is possible through the provision of incentives like lowering royalty rates for such projects. This informed the rationale for the main purpose of this research, which was to modify the South African mining royalty regime for optimal mineral resource use and management of mineral rents. This formulae modification was to be accomplished by finding way(s) of tweaking the royalty formulae to result in more value-added to the financial positions of miner-turned-refiner companies/projects. The result of the formulae-tweak was to optimize the beneficiation objective of the MPRRA, thereby providing answers to the question of whether SA could have a mineral fiscal instrument that can successfully facilitate the establishment of other economic linkages (more mineral beneficiation). In addition, formulae modification was to provide a lead to addressing another identified critical issue of whether SA could possess a system for the optimal management of rents generated using the MPRRA's rent-capturing feature. Management of the rents collected by the royalty instrument would allow for maximum economic savings and investment for the benefit of its citizens.

As stated in the previous section, the extensive work carried out in the research to provide the answers to the research questions and the findings, were summarized. Based on these findings, the emphatic conclusions are that:

1. The MPRRA in its current form is more of a rent-collection instrument than a beneficiation-incentivising instrument;

2. The use of the royalty regime in all the policy options assessed, did not generally result in significant statistical differences and Realized beneficiation incentive in favour of the refiner. This result implied that refiners were penalized more than miners-only in terms of royalty payments and this was observed for all the commodity sectors assessed except Steel_Iron ore sub-sector. Hence, if the royalty regime was the ONLY instrument available to government to facilitate more mineral beneficiation, it is unlikely to encourage more miners to become refiners;

3. However, in terms of modifying the parameters of the royalty regime for **increased possibility/ability** of providing realized beneficiation incentive to the refiner, **policy option two (model 2)** was the most optimal in an era where one of SA government's paramount objectives is achieving more mineral beneficiation locally. Model 2 specifies that the current formula for unrefined minerals be unchanged, while only the parameters of the current royalty formula for refined minerals be changed as follows:

   R% = 0.5% + $(\frac{30}{F})\%$

   Where, minimum royalty rate (R%) is 0.5%, maximum royalty rate (R%) is 3%, maximum profitability ratio (X) is 30%, and factor for refined minerals (F) is 12;

4. In the era that government becomes satisfied with the level of local mineral beneficiation/value-addition, it can then charge royalty payments from all classes of mineral producers in terms of **model 5**. Model 5 specifies that only the modified version of the current formula for unrefined minerals be applicable to all classes of mineral producers; with the parameters of the royalty formula being changed as follows:

   R% = 0.5% + $(\frac{26}{F})\%$

Where, minimum royalty rate (R%) is 0.5%, maximum royalty rate (R%) is 7%, maximum profitability ratio (X) is 26%, and factor for refined minerals (F) is 4;

5. For royalty collection, the parameters of the recommended versions of the MPRRA (policy options) are stated in Table 10.1.

Table 10.1: Parameters of recommended mineral royalty policy options.

Royalty regime / Parameters	Current MPRRA	Tweaked MPRRA as per recommended Model 2	Tweaked MPRRA as per recommended Model 5	Remarks
Min. royalty rate (%) for refined minerals	0.5%	0.5%	0.5%	This satisfies SA's rightful claim to charge compensation for her non-renewable resources.
Min. royalty rate (%) for unrefined minerals	0.5%	0.5%	0.5%	This satisfies SA's rightful claim to charge compensation for her non-renewable resources.
Max. royalty rate (%) for refined minerals	5%	3%	7%	This satisfies SA's rightful claim to collect maximum revenues for her non-renewable resources.
Max. royalty rate (%) for unrefined minerals	7%	7%	7%	This satisfies SA's rightful claim to collect maximum revenues for her non-renewable resources.

Table 10.1: Parameters of recommended mineral royalty policy options (*continued*).

Max. profitability ratio (%) for refined minerals	60%	30%	26%	This allows SA to collect economic rent based on maximum profitability of refiners.
Max. royalty rate (%) for unrefined minerals	60%	60%	26%	This allows SA to collect economic rent based on maximum profitability of miners.
F-factor for refined minerals	12.5	12	4	
F-factor for unrefined minerals	9	9	4	

6. In terms of optimal management of rents collected by the regime, an SWF should be established in SA. A brief detail of the modus operandi, content and use of this SWF would be provided in next section.

Although effecting a change to the MPRRA – modification of the formulae as per models 2 and 5 – potentially have positive implications for both government and mining investors on the long run, it could pose a threat to investments on the short-term. This is because frequent changes in policies could present an unstable and unpredictable regulatory environment, which SA's economy desperately does not need at the moment. However, if these modifications are not considered as 're-inventing the wheel' but as win-win policy reforms, then these should ameliorate any perceptions of risk. Furthermore, it is recommended to the government that if it decides to keep the current MPRR regime unchanged, it would not lose significantly in terms of revenue-collection. This is due to the proven capability of the regime as an effective compensatory revenue and rent-collection instrument.

10.3 RECOMMENDATIONS

Having established that the main objectives associated with the imposition of the MPRRA are in line with global trends, for its beneficiation aspect to effectively support the resource-based industrialization drive, its modified version needs to work in concert with other initiatives and/or further studies. Hence, the recommendations of this research are that:

1. The parameters of the MPR royalty regime should be modified as per **policy option two (model 2)** for **increased possibility** of providing realized beneficiation incentive to the refiner. To reiterate, Model 2 specifies that the current formula for unrefined minerals be unchanged, while only the parameters of the current royalty formula for refined minerals be changed as follows:

   $$R\% = 0.5\% + \left(\frac{30}{F}\right)\%$$

Where, minimum royalty rate (R%) is 0.5%, maximum royalty rate (R%) is 3%, maximum profitability ratio (X) is 30%, and factor for refined minerals (F) is 12.

2. A study be conducted for the purpose of enabling the MPPR regime to further incentivise refining companies on their cost-side by adjusting its royalty base (aggregate gross sales) to one that closely resembles a Net Smelter Return (NSR), which allows for the deduction of some costs (marketing, transport, other operating and/or capital) attributed to refining. This is in the light of the observation that the royalty formulae are sensitive to revenue (royalty base) and its parameters.

3. A study be carried out to assess the impact of applying the modified royalty formula for refined minerals (as per model 2's specifications) as well as modified royalty formula for unrefined minerals (as per model 5's specifications) on an NSR royalty base.

4. As specified in the conclusion section, SA government should establish an SWF as a means of addressing optimal mineral revenue management. The purpose of this 'special' SWF vehicle would be to set aside funds needed for investments that will facilitate mineral beneficiation and/or to subsidize SA SME companies that seek to move-up the mineral value chain. This SWF should be financed by saving the minimum royalty rate (0.5%) portion of the revenue collected by the MPPRA, because the 0.5% portion of the regime is the more certain portion of royalty payments, as it has to be paid irrespective of whether mining companies make a profit or not.

5. Proposal for the implementation of this research's findings and results to be presented to other mineral-rich developing countries that do not refine their minerals at present, so as to facilitate optimal resource use in their jurisdictions. The MPRRA's beneficiation provisions can be simulated and adapted to their peculiar circumstances.

Other initiatives proposed for the government to carry out to support its beneficiation objectives are as follows:

1. The escalated implementation of SA's infrastructure investment programme that will provide access to cost-competitive, efficient and improved infrastructure: transportation – rail, ports, water, electricity. This is in accordance with one of National Treasury's priorities, which is to increase investment in infrastructure and industrial capital (Yes Media, 2018).

2. SA government's continuous and intensified investment in establishing new as well as strengthening of already-existing universities, FET colleges and other educational institutions[250] that train and produce skilled labour in engineering, scientific and technical services. Government should also channel more resources to support innovation[251], research and development (through institutes like CSIR, Mintek) in cooperation with the private sector research partners such as Anglo Research, Anglo Platinum, and the Aurum Research Institute etc. (Kahn, 2013).

3. Accelerating the realization of regulatory provisions and specifications of other value-addition related policies (reviewed in this research) that would guarantee access to raw materials at sustainable developmental prices. These provisions should ensure that the developmental prices required by mining companies to facilitate the value-addition process should be set in such a way that they would not result in the 'death' of the primary mining industry.

4. Increased active developmental role-play of government in the process of economic development using a broad-based, risk-management approach to policymaking and implementation. This can be achieved by accelerating the achievement of government's promise to provide policy certainty.

[250] "Improving education and skills development to raise productivity" (National Treasury (3), n.d.).
[251] "Innovation would step up SA's ability to produce high quality, niche products" (National Treasury (3), n.d.).

5. Intensification of the integration of all the government departments associated with mineral beneficiation and industrialization.

6. Speedy contribution of government to the actualizing the initiatives that address the market barriers for SA’s refined mineral products, so as to open new export markets for value-added products.

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APPENDIX Ia

Table 1a: Indication of the proportion of minerals and petroleum products exports to total exports in some SSA mineral-rich countries as at 2013 and 2014.

SSA Country	Value of resource exports to total country exports (earnings)
Angola	the petroleum industry alone accounted for about 45% of the GDP, 95% of total exports, and 80% of Government revenue. The diamond industry accounted for about 2% of total exports.
Botswana	diamond accounted for 85.3% of national exports were valued at $6.7 billion.
Burkina Faso	Gold continued to be the country’s most important mineral commodity, accounting for about 66% of total exports and 8.6% of total Government revenues.
Cameroon	Crude petroleum was Cameroon’s main export commodity and accounted for about 51% of total exports, and it was the source of about 26% of Government revenues.
Central African Republic	Diamond and gold were the only mineral commodities for which production data had been reported in the Central African Republic.
Chad	Hydrocarbons were a leading segment of Chad’s economy, accounting for most of the country’s exports of goods and Government revenues.
Congo, Democratic Republic of	Copper accounted for 68% of the total value of the country’s exports; cobalt, 17%; crude petroleum, 8%; diamond, 2%; and gold, 1%.
Congo, Republic of	The oil industry accounted for about 72% of Government revenue and 81% of exports.
Gabon	Exports of crude petroleum and manganese were estimated to account for about 84% and 10%, respectively, of the total value of exported goods.
Ghana	Gold, petroleum and gas exports accounted for about 61% of the country’s total export earnings in 2014.
Guinea	bauxite and Aluminum accounted for about 88% of total exports.
Lesotho	Diamond was also a major export for Lesotho, representing 34% of all exports.
Liberia	Diamond, gold, and iron ore exports accounted for about 73% of Liberia’s total export revenues.
Mali	gold exports were estimated to have accounted for nearly 67% of total exports.
Mozambique	A combined total of exports of aluminum, coal, natural gas, ilmenite, rutile, and zircon, was 53%.
Namibia	Diamond continued to dominate Namibia’s exports. The Kimberley Process Certification Scheme reported that about 2 million carats of diamond, valued at $1.1 billion, was exported in 2014.

Table 1a: Indication of the proportion of minerals and petroleum products exports to total exports in some SSA mineral-rich countries as at 2013 and 2014 (*continued*).

Niger	Uranium was estimated to have accounted for about 32% of the country's total export revenue in 2014. Petroleum exports were estimated to have accounted for about 26% of total export revenues.
Nigeria	Crude petroleum accounted for 74.4% of total exports.
Rwanda	Commodities, particularly gold, tin, tantalum, tungsten, tea, and coffee, generated over 57% of Rwanda's export revenues.
South Africa	About 70% of crude mineral products and 84% of processed mineral products, by value, were exported in 2014. South Africa's exports of gold amounted to $5.31 billion in 2014; iron ore; $4.69 billion; coal, $4.51 billion; platinum, $4.09 billion; manganese ore, $1.31 billion; palladium, $1.2 billion; diamond, $685 million; nickel, $683 million; chromite, $517 million; rhodium, $452 million; copper, $219 million; iridium, $136 million; ruthenium, $51 million; and other crude mineral products, which included ilmenite, rutile, and zircon, $890 million.
South Sudan	Crude petroleum production provided more than 90% of the Government's revenues.
Sudan	Crude oil and gold were the country's main mineral exports, along with modest quantities of chromite, petroleum products, and scrap metals. Sudan's mineral exports, which included chromite, crude oil and refined petroleum products, gold, and ferrous and nonferrous scrap metals, accounted for about 59% of total exports.
Zambia	Copper exports accounted for an estimated 75% of Zambia's total value of exports.
Zimbabwe	Of the approximately 30 minerals and mineral-based commodities produced in Zimbabwe, diamond, gold, and platinum-group metals (PGMs) were the most economically significant.

Source: Unknown author (2), 1997; Bermúdez-Lugo (1), 2017; Yager (1), 2017; Bermúdez-Lugo (2), 2017; Matzko, 2017; Barry (1), 2017; Mobbs and Taib, 2017; Barry (2), 2017; Yager (2), 2017; Trimmer III (1), 2017; Bermúdez-Lugo (3), 2017; Bermúdez-Lugo (4), 2017; Barry (3), 2017; Bermúdez-Lugo (5), 2017; Bermúdez-lugo (6), 2017; Yager (3), 2017; Yager (4), 2017; Export.gov, 2019; Yager (5), 2017; Taib (1), 2017; Taib (2), 2017; Trimmer III (2), 2017; and Barry (4), 2017.

APPENDIX Ib

Table 1b: Summary of the different views for and against the MPRDA Mineral beneficiation Amendments.

Supporting opinions	Opposing opinions
The industry pointed out that it supports: 1. Government's drive to promote greater beneficiation in South Africa. 2. The Minister's prerogative to designate a mineral as strategic in support of the beneficiation objective, which will be done in consultation with the related mining companies. 3. The partnership-driven approach to the designation of minerals and when dealing with critical issues, such as primary energy security for local supply. 4. Adoption of the 'mine gate price or agreed price' because it gave greater clarity on the issue of domestic pricing. 5. The engagement of government with business and labour to promote growth and transformation in the mining sector.	The opposition indicated: 1. Lack of support for the powers placed in the hands of the Minister to designate and declare certain mineral resources as strategic for beneficiation. 2. Lack of support for 'excess' power given to the minerals minister by the in respect of awarding mine and water licenses. 3. Lack of support for the minister's discretionary power to block exports and force mines to sell minerals at a discounted local price which is contrary to free-market principles (McKay, 2014). 4. The Bill's requirement for a producer to sell at less than the market price was unconstitutional as it would constitute an expropriation in terms of section 25 of the Constitution. This will also contravene international trade agreements. 5. The new legislation did not appear as one that will create the certainty required to attract prospective mining investors, which would be a great cost to South Africa.

Source: Webber Wentzel (2014), Kolver, (2014b), McKay (2014) and NUMSA (2013).

APPENDIX II

Table 2: Examples of instruments available to Government and actions required by industry players for the mitigation mineral beneficiation related constraints in SA.

Potential Instruments at Government's disposal	Action by Business
• Leverage the state's custodianship of the country's minerals to facilitate downstream beneficiation • The MPRDA is currently being amended to strengthen beneficiation provisions • Leverage on the beneficiation offset element of the Mining Charter • Strengthen and leverage on existing pieces of legislation such as Diamond export levy to promote reliable access to raw materials	• Take advantage of the mineral value proposition to expand local demand for mineral ores • Comply with legislation

Source: DMR (2013)

APPENDIX III

5.2.1.1 Royalty rate

As mentioned previously, the provisions of the MPRR regime is such that two (2) formulae exist for calculating royalty rates based on the classification of minerals as either refined or unrefined. In this regard, the condition of the mineral as either refined or unrefined is stipulated in either Schedule 1 or 2 of the Act. Hitherto, the rates for refined and unrefined minerals are calculated thus:

Refined minerals:

$Y\% = 0.5 + \left(\frac{\text{EBIT}}{\text{Aggregate gross sales x 12.5}}\right) \text{ x } 100$

OR $Y\% = 0.5 + \left(\frac{X}{12.5}\right)$; and

Unrefined minerals:

$Y\% = 0.5 + \left(\frac{\text{EBIT}}{\text{Aggregate gross sales x 9}}\right) \text{ x } 100$

OR $Y\% = 0.5 + \left(\frac{X}{9}\right)$

Where,

- Minimum royalty rate payable for all minerals = 0.5%.
  This minimum charge ensures that the Government (as custodian) always receives some level of royalty payments for the permanent loss of non-renewable resources (Strydom, 2012);
- Maximum royalty rates payable at maximum profitability (100%) are 5% and 7% of gross sales of for refined and unrefined minerals respectively, in that year of assessment. The reduced royalty rate of 5% is as a reward for additional costs on value addition (Oshokoya, 2012);
- X = profitability indicator i.e. $\left(\frac{\text{EBIT}}{\text{Aggregate gross sales}}\right) \text{ x } 100$;
- F (Factor) = 12.5 and 9.0, which determine maximum rates for refined and unrefined minerals respectively;

- EBIT = this is defined as earnings before interest and taxes. It is realized from the sum of gross sales after adding recoupments under Income Tax Act 1962 (ITA) less operating expenditure less capital expenditure in the year incurred and any other amounts that are deductible in terms of the ITA. EBIT measures an extractor's net operating profits from mining and with the exclusion of tax definitions (Strydom, 2012). According to Strydom (2012) and Cohen (2013), some other exclusions are applicable, which include:
  - other charges or deductions in respect of financial instruments as defined in the ITA (other than option contracts, forward contracts or other instruments, the value of which is derived directly or indirectly with reference to mineral resources);
  - interest deductions from debt and the cost of carrying derivatives;
  - Expenditure incurred on transport insurance and handling after condition specified;
  - Carry forward of assessed loss;
  - Foreign exchange losses; and
  - The royalty payment.

  However, Strydom (2012) stated that “the costs from mineral resource hedges (forward contracts) are deductible, because these hedges act as an economic offset against mineral resource gross sales”.
- Aggregate Gross sales: This is defined as arm’s length gross sales value in the transfer252 of all mineral resources, as defined in Schedule 1 and 2 of the Act[253] (PwC, 2009b). As with EBIT, various inclusions and exclusions are applicable. Some of the exclusions include:
  - Amounts received regarding transport insurance and handling after condition specified;
  - Foreign exchange gains (Cohen, 2013).

[252] As amended, Transfer is very widely defined as:
(a) the disposal of a mineral resource; or
(b) ………. (deleted)
(c) the consumption, theft, destruction or loss of a mineral resource, other than by way of flaring or other liberation into the atmosphere during exploration or production if that mineral resource has not previously been disposed of, consumed, stolen, destroyed or lost (Wainwright, 2014).

[253] In other words, Gross sales is defined as the amount received or accrued in an arm’s length transaction during the year of assessment, in respect of the transfer of a mineral resource in the condition specified in Schedule 1 or 2 of the Act (Oshokoya, 2012).

5.2.1.2 Royalty base

The tax base to which the MPRR liability is charged is gross sales.

5.2.1.3 Royalty source

According to the Act, the source of revenue from which royalty payments accrue is the sales receipts in respect of the transfer of mineral resources extracted from within SA. The payers liable for royalty payments are all entities/persons[254] within the Republic of SA, who hold:

- a prospecting, mining, exploration or production right;
- a retention permit;
- mining permit;
- a lease or sublease in respect of a production right; or
- any person who wins or recovers a mineral resource within the Republic of SA (PwC, 2009b).

For royalty payment compliance purposes, Section 2 of the Mineral and Petroleum Resources Royalty Administration Act[255] stipulates that these 'persons' who qualify for registration in terms of the Act must register with SARS (PwC, 2009a).

5.2.2 Modus operandi

Royalty payments are payable based on the calculation of the rate[256] as a percentage of gross sales[257] (PwC, 2009b). Payments of royalties are due semi-annually and are estimated on a basis similar to provisional tax for income tax purposes (*idem*). It is noteworthy that these mineral royalties are deductible for income tax purposes (Strydom, 2012).

254 "The 'person' liable to pay is defined as including an insolvent estate, a deceased estate and a trust" (Wainwright, 2014).

255 Part III of the Royalty Administration Act deals with the payments and returns related to the mineral resource extractor

256 Royalty rate calculated as per the applicable formula that is dependent on whether the mineral is refined or unrefined

257 Source is from minerals won within SA. "Section 11 of the Mineral and Petroleum Resources Royalty Act states that all transactions concluded under the royalty regime must be concluded on an arm's length basis" (PwC, 2009a).

Moreover, in terms of the profitability, when an operating loss is reported (i.e. EBIT is a negative amount) in any year of assessment, the profitability indicator is deemed to be nil. This does not imply that the payer is excluded from royalty payments in that year, instead the payer would be liable to pay the minimum royalty charge at the rate of 0.5%, as compensation for loss of SA's non-renewable resources. It must be noted that this 'relief', which is allowed in terms of the profitability dependency provisions of the Act, opens this instrument to abuse through skilful tax avoidance schemes. Therefore, as stated by PwC (2009b), "it is imperative that strict controls be implemented to monitor and evaluate tax balances such as unredeemed capital expenditure, ring fencing of assessed losses and non-deductible expenditure for the purposes of this Act".

Furthermore, with the trigger point for royalty payment being upon transfer, the Act provides for different scenarios/issues that could arise when the extractor (transferor) may not be the same person as the transferee. Such issues include Transfer pricing and/or "all transactions[258] between connected and unconnected persons as well as local transfers" (PwC, 2009a). Hitherto, some of the Act's provisions for such matters are;

- "Because mineral resources are often temporarily exported for refining, the temporary export of mineral resources is not regarded as a transfer;
- "Unrefined mineral resources are sometimes transferred with ancillary mineral resource by-products, which in terms of the current provisions of the Royalty Act, must be treated separately for purposes of the Royalty Act. For instance, although Platinum Group Metals (PGMs) are also listed under unrefined mineral resources, the group consists of several mineral resource by-products, which are all treated as part of the PGMs for purposes of the unrefined (Schedule 2) mineral resources calculation. The separation of by-products creates a significant compliance burden, as the actual value of the by-products is difficult to quantify" (Strydom, 2012).

[258] The Act specifies that all transactions including those between connected and unconnected persons, are to be concluded on an arm's length basis (PwC, 2009b).

The Act also has provisions for exemptions for an extractor in respect of a year of assessment under certain conditions. Some of these exemptions include:

- An extractor is exempt from the royalty liability, if –
    a) "Gross sales of that extractor in respect of all mineral resources transferred does not exceed R10 million during that year;
    b) The royalty in respect of all mineral resources transferred that would be imposed on the extractor for that year does not exceed R100, 000;
    c) The extractor is a resident as defined in section 1 of the IT Act throughout that year;
    d) The extractor is registered for that year pursuant to section 2 of the Admin Act; and
    e) This exemption is determined on an annual basis" (Cohen, 2013).

It is possible to have various entities/persons elect to be registered as extractors in terms of the Royalty Act (i.e. mineral right owners and persons extracting the mineral resource), but only the person that transfers the mineral will pay the Royalty. The Caveat, however, is that if a person voluntarily elects to register for the purposes of this Act, such a person will not be eligible for this rollover relief benefits "when subsequently transferring mineral resources to other parties" (Cohen (2013) and PwC (2012)).

As mentioned previously, the Act has seen some amendments to its provisions in recent past. The ITAA explanatory memorandum made it clear that the proposed amendments were aimed at a range of minerals and coal[259] specifically. As stated by Cohen (2013), these amendments came through some of the following instruments:

- Taxation Laws Amendment Act Nos 17 and 18 of 2009 (Extensive amendments);
- Taxation Laws Amendment Act Nos 7[260] and 8 of 2010 (Minor amendments); and

[259] It appeared that coal was specifically targeted because the numbers of actual receipts in comparison do expected estimated receipts did not add up. This discrepancy laid in the fact that the sale of coal was one of the highest of the resources in SA whilst royalty payments from the coal industry were some of the lowest (Wainwright, 2014).

[260] Section 6A was introduced into the Royalty Act by the Act No. 7 of 2010, and is applicable to mineral resources transferred on or after 1 March 2010. Section 6A was specifically aimed at assisting taxpayers in establishing

- Taxation Laws Amendment Act No. 24 of 2011 (Minor amendments).

The details of some of such amendments include:

1. The word ‘minimum’ has been removed from the term ‘minimum condition’ in Schedule 6A[261] which deals with the application of Schedule 2 (unrefined resources). Consequently, where any unrefined mineral resource is transferred below the condition specified in Schedule 2, the mineral resource must be considered to have been brought to the condition specified. Where any unrefined mineral resource is transferred beyond the condition specified in Schedule 2, the mineral resource must be treated as having been transferred at the higher of the condition specified or the condition in which that mineral was extracted.
2. The definition in schedule 2 of the unrefined condition of PGM concentrate was changed from 150 ppm to 150 ppm together with all other metals and minerals contained in the concentrate.
3. The price of the concentrate is calculated in terms of a formula including the prices of all the metals included in the concentrate.
4. The determination of the transfer point for mineral royalty purposes hinges on the ppm of PGM’s in the concentrate.
5. The price of the concentrate at disposal thereof is determined solely with reference to the mineral resource listed in Schedule 2, the specified condition for the other minerals in the concentrate must not be taken into account for the purposes of the application of that Schedule.
6. PGM concentrate definition change was not extended to other concentrates (i.e. 150 ppm together with all other metals <u>and minerals contained in the concentrate</u>) (Cohen, 2013).

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how the gross sales for mineral resources which are extracted either below or above the condition specified in schedule 2 would be established, once the mineral resource is transferred (KPMG, 2013).

[261] Furthermore, section 6A and Schedule 2 have been amended by the inclusion of a range of conditions for certain mineral resources. If the mineral resource is transferred:

a. below the range it is considered to have been transferred at the minimum of the range;
b. between the range values, it is considered to have been transferred at that particular condition;
c. Above the given range it is considered to have been transferred at the maximum of the range. For example, coal is a Schedule 2 resource and it has been given, as a result of this amendment, a range calorific value of between 19.0 MJ/kg and 27 MJ/kg. Therefore, if coal is transferred with a calorific value of: i. 17MJ/kg, it must be considered to have been transferred at 19.0MJ/kg; ii. 23MJ/kg, it must be considered to have been transferred at 23MG/kg; and iii. 29MJ/kg, it must be considered to have been transferred at 27MJ/kg (Cohen, 2013).

According to KPMG (2013), although it was claimed that the amendments would clarify how mineral resources with a specified condition that falls within a range would be handled for purposes of determining the gross sales value, effectively, this was not achieved. This was due to fact that the amendments appeared to "yet again confuse three concepts[262] which in the determination of the gross sales" (KPMG, 2013).

Nonetheless, the expected result of the amendments to the Royalty Act is "less in the nett for extractors and more in the National Revenue Fund" (Wainwright, 2014).

[262] These concepts: "condition specified at extraction", "the range in which the mineral resource is extracted" and "the condition specified at the transfer point", which ultimately impact the determination of the gross sales (KPMG, 2013).

APPENDIX IV

Econometrics phase 1

In order to independent samples t-test (test for differences between two group samples) using IBM SPSS Statistics, there are some steps that have to be followed. These are as follows:

Step 1: Levene's Test for Equality of variances

In the case where variances of the samples are not known, Levene's test for Equality of variances has to be carried out first. Levene's test involves the calculation of the groups' variances and testing for the equality of the variances. Its procedures are as follows:

a. The hypothesis has to be identified first:

   Null hypothesis – H_0: The variances are equal

   Alternative hypothesis – H_1: The variances are not equal

b. Then compare p-value (representing the Variances and specified as Sig. in Table above) with the Confidence level[263]: 5%

c. Reject or fail to reject null hypothesis. Then carry out T-test, if applicable.

Step 2: T-Test for Equality of Means

After Levene's test has been carried out, the next step is to carry out the T-test for Equality of means. This T-test is used to determine if there is a statistically significant difference between groups (royalties for refined minerals vs. royalties for unrefined minerals per commodity). Using the Independent Samples Test table, the two rows – Equal variances assumed and Equal variances not assumed – would be used for the T-test procedure. This procedure is as follows:

a. If the null hypothesis from Levene's test is failed to be rejected, then the "Equal variances assumed" row is referred to.

   If the null hypothesis from Levene's test is rejected, then the "Equal variances not assumed" row is referred to.

b. The next step is to identify the hypothesis for the T-test:

   Null hypothesis – H_0: There is no difference between groups

[263] "Historically, 0.05 has been used for alpha. This means that about one test in twenty will falsely reject the null hypothesis…." (NCSS.com, 2014).

Alternative hypothesis – H_1: There is a difference between groups

c. Then compare p-value (specified as Sig. (2-tailed) in Table above) with the Confidence level: 5%

Step 3: Calculating the effect size for independent-samples test

After conducting the t-test, if there is statistically significant difference between two group samples, it is important to calculate the magnitude of the difference using Eta Squared[264].

Eta squared (η^2) = $\frac{t^2}{t^2+(N1+N2-2)}$

where:

N[265] = Sample size

t value is stated in Independent Samples Test table

The answer determined by Eta squared calculation is compared with the commonly used guidelines proposed by Cohen (1988) to determine magnitude of difference. Cohen's guidelines specify that if:

η^2= 0.01 = small effect; or

η^2= 0.06 = moderate effect; or

η^2= 0.14 = large effect

In the context of this research, the magnitude of difference between royalties paid by refined mineral producers and unrefined mineral producers, is the expected result for step 3.

[264] "Eta squared measures the proportion of the total variance in a dependent variable that is associated with the membership of different groups defined by an independent variable" (Richardson, 2011).

[265] From Group statistics Table.

APPENDIX V

Model 1: Interpretation of independent samples t-test results in terms of Econometric analysis phase 1's specifications

<u>Gold sector</u>:

Step 1:

p-value (Sig.) = 0.001 is lesser than 0.05

Therefore, we reject the null hypothesis, meaning that variances for royalties paid by 'refined' gold producer and royalties paid by 'unrefined' gold producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, we reject the null hypothesis, meaning that there is a statistically significant difference between royalties paid by 'refined' gold producer and royalties paid by 'unrefined' gold producer.

Step 3:

Eta squared (η^2) = $\frac{(-11.493)^2}{(-11.493)^2+(9+9-2)}$ = 0.89195

η^2 = 0.89 to 2 d.p.

Using Cohen's guidelines,

0.89> 0.14 = very large effect

Step 4:

The difference between the mean Rands values of royalty payments of the two classes of producers in the gold sector is as follows:

With the miner-only paying more royalties than the refiner, the magnitude of this difference using their average royalty payments for the years of assessment is R84,804,473.

<u>PGM sector:</u>

Step 1:

p-value (Sig.) = 0.108 is greater than 0.05

Therefore, the null hypothesis fails to be rejected, meaning that variances for royalties paid by refined PGM producer and royalties paid by unrefined PGM producer are equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances assumed' row = 0.586 > 0.05

Therefore, the null hypothesis fails to be rejected, meaning that there is no statistically significant difference between refined royalties and unrefined royalties for platinum.

Step 3:

No need to calculate Eta squared (η2) value since there is no statistically significant difference between refined and unrefined royalties for platinum.

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the PGM sector is as follows:

With more evidence from financial statement and realized beneficiation incentive assessment showing that refiner paid more royalties than the refiner in many of the years of assessment, the magnitude of this difference based on their average royalty payments is R37,015,990.

Steel-iron ore sector:

Step 1:

p-value (Sig.) = 0.001 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined iron ore (steel) producer and royalties paid by unrefined iron ore producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.001 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by refined iron ore (steel) producer and royalties paid by unrefined iron ore producer.

Step 3:

Eta squared (η^2) = $\frac{(-4.983)^2}{(-4.983)^2+(9+9-2)}$ = 0.608134

η^2 = 0.61 to 2 d.p.

Using Cohen's guidelines,

0.61> 0.14 = very large effect

Step 4:

The difference between the mean Rand values of royalty payments of the two classes of producers in the iron ore sector is as follows:

With the miner-only paying more royalties than the refiner, the magnitude of this difference using their average royalty payments for the years of assessment is R1,426,655,228.

<u>Synfuels-Coal sector</u>:

Step 1:

p-value (Sig.) = 0.009 is lesser than 0.05

Therefore, we reject the null hypothesis, meaning that variances for royalties paid by refined Coal (synfuels) producer and royalties paid by unrefined Coal producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, we reject the null hypothesis, meaning that there is a statistically significant difference between royalties paid by refined Coal (synfuels) producer and royalties paid by unrefined Coal producer.

Step 3:

Eta squared (η^2) = $\frac{(7.560)^2}{(7.560)^2+(9+9-2)}$ = 0.781282

η^2 = 0.78 to 2 d.p.

Using Cohen's guidelines,

0.78> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the coal sector is as follows:

With the refiner paying more royalties than the miner-only, the magnitude of this difference using their average royalty payments for the years of assessment is R1,444,842,971.

APPENDIX VI

Model 1’s second Gold sector assessment (the true refinement royalty formula case).

Table 7.12: Royalty formula for refined minerals applied to financial information of Gold Fields’ South Deep mine.

	Year / units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	1,104,000	1,367,000	1,241,000	1,681,000	2,440,000	2,106,000	2,347,000	1,323,000	1,496,000
Gold produced	kg	5,076	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold sold	kg	5,166	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold price received	R/kg	156,899	231,187	259,921	288,022	363,537	438,961	434,915	442,023	478,166
Gross Sales Revenue	R	810,540,234	1,669,170,140	1,412,410,714	2,372,149,192	3,086,800,309	3,692,100,130	4,086,900,014	2,756,900,008	2,945,499,973
Total Operating costs	R	720,000,000	1,263,526,000	1,188,419,000	1,674,422,000	2,138,400,000	2,480,751,000	3,089,280,000	2,656,310,000	3,000,088,000
Operating profit before Royalty + Capex = Eo	R	90,540,234	405,644,140	223,991,714	697,727,192	948,400,309	1,211,349,130	997,620,014	100,590,008	- 54,588,027
Comment: Tax Shield										
Capex (redemption)	R	- 283,400,000	- 784,700,000	- 1,020,500,000	- 1,613,300,000	- 1,982,400,000	- 2,575,800,000	- 1,943,300,000	- 994,360,000	- 848,300,000
EBIT before Royalties after Capex (E)	R	- 192,859,766	- 379,055,860	- 796,508,286	- 915,572,808	- 1,033,999,691	- 1,364,450,870	- 945,679,986	- 893,769,992	- 902,888,027
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Royalty rate = R%	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

Table 7.12: Royalty formula for refined minerals applied to financial information of Gold Fields' South Deep mine (*continued*).

Royalty paid by refiner (Deep mine)	R	4,052,701	8,345,851	7,062,054	118,607,456	15,434,002	18,460,501	20,434,500	13,784,500	14,727,500
Operating Profit (Eo) less Royalties (R) = E*	R	86,487,533	397,298,289	216,929,660	685,866,446	932,966,307	1,192,888,629	977,185,514	86,805,508	-69,315,527

Source: Gold Fields Limited (2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

Table 7.13: Royalty formula for refined minerals applied to financial information of Sibanye Gold's Beatrix mine.

	Year / units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	3,590,000	3,215,000	2,991,000	3,051,000	3,817,000	3,368,000	4,091,000	4,546,000	4,319,000
Gold produced and sold	kg	16,903	13,625	12,164	12,188	10,787	8,981	9,722	10,354	10,105
Gold price received	R/kg	157,249	231,750	259,126	287,187	371,772	435,698	433,460	441,018	476,546
Gross Sales Revenue (G)	R	2,657,979,847	3,157,593,750	3,152,008,664	3,500,235,156	4,010,304,564	3,913,003,738	4,214,098,120	4,566,300,372	4,815,497,330
Operating Costs:										
Unit Operating costs	R/t	432	536	681	745	631	783	732	705	785
Total Operating costs	R	1,550,880,000	1,723,240,000	2,036,871,000	2,272,995,000	2,408,527,000	2,637,144,000	2,994,612,000	3,204,930,000	3,390,415,000
Operating profit before Royalty + Capex = Eo	R	1,107,099,847	1,434,353,750	1,115,137,664	1,227,240,156	1,601,777,564	1,275,859,738	1,219,486,120	1,361,370,372	1,425,082,330
Comment: Tax Shield										
Capex	R	- 592,800,000	- 576,600,000	- 629,400,000	- 650,600,000	- 611,100,000	- 658,200,000	- 537,000,000	- 548,000,000	- 596,500,000

Table 7.13: Royalty formula for refined minerals applied to financial information of Sibanye Gold's Beatrix mine (*continued*).

EBIT before Royalties after Capex (E)	R	514,299,847	857,753,750	485,737,664	576,640,156	990,677,564	617,659,738	682,486,120	813,370,372	828,582,330
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	19%	27%	15%	16%	25%	16%	16%	18%	17%
Royalty rate = R%	%	2.1%	2.7%	1.7%	1.8%	2.5%	1.8%	1.8%	1.9%	1.9%
Royalty paid by refiner (Shallow mine)	R	54,433,887	84,408,269	54,619,056	63,632,388	99,305,728	68,977,798	75,669,380	87,901,132	90,364,073
Operating Profit (Eo) less Royalties (R) = E*	R	1,052,665,960	1,349,945,481	1,060,518,608	1,163,607,768	1,502,471,836	1,206,881,940	1,143,816,740	1,273,469,240	1,334,718,257

Source: Gold Fields Limited (2008, 2009, 2010 and 2011); SibanyeGold (2012, 2013a, 2014a and 2015a); SibanyeGold (2013b, 2014b and 2015b).

Realized beneficiation incentive assessment for second gold sector case

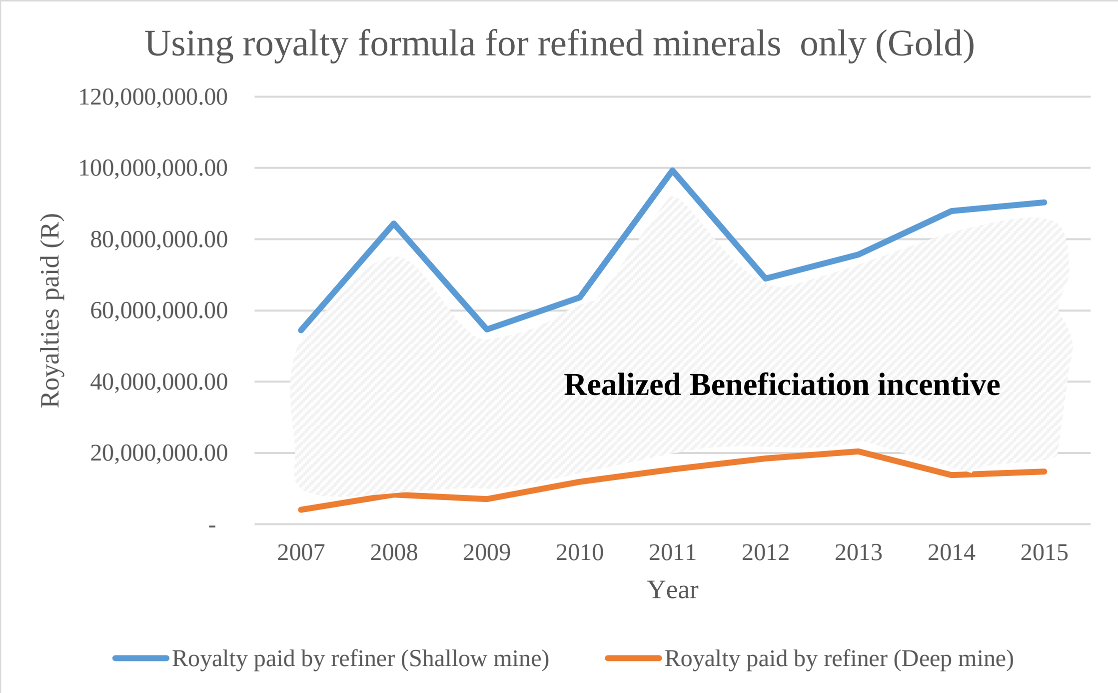

Figure 7.5: Royalty payments for both refined gold producers.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 7.5, it can be observed that the shallow mine paid a higher penalty in terms of royalty payments, just like when the royalty formula for unrefined minerals was applied to this mine in model 1. Hence, this implies that the realized beneficiation incentive that appears to have accrued to the deep mine based on the difference in royalty payments, has nothing to do with level of mineral processing.

APPENDIX VII

Model 2's Gold sector assessment.

Table 8.2: Royalty formula for refined minerals applied to financial information of Gold Fields' South Deep mine.

	Year / units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	1,104,000	1,367,000	1,241,000	1,681,000	2,440,000	2,106,000	2,347,000	1,323,000	1,496,000
Gold produced	kg	5,076	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold sold	kg	5,166	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold price received	R/kg	156,899	231,187	259,921	288,022	363,538	438,961	434,915	442,023	478,166
Gross Sales Revenue	R	810,540,234	1,669,170,140	1,412,410,714	2,372,149,192	3,086,800,309	3,692,100,130	4,086,900,014	2,756,900,008	2,945,499,973
Total Operating costs	R	720,000,000	1,263,526,000	1,188,419,000	1,674,422,000	2,138,400,000	2,480,751,000	3,089,280,000	2,656,310,000	3,000,088,000
Operating profit before Royalty+Capex = Eo	R	90,540,234	405,644,140	223,991,714	697,727,192	948,400,309	1,211,349,130	997,620,014	100590008.17	-54,588,027
Comment: Tax Shield										
Capex	R	-283,400,000	-784,700,000	-1,020,500,000	-1,613,300,000	-1,982,400,000	-2,575,800,000	-1,943,300,000	-994,360,000	-848,300,000
EBIT before Royalties after Capex (E)	R	-192,859,766	-379,055,860	-796,508,286	-915,572,808	-1,033,999,691	-1,364,450,870	-945,679,986	-893,769,992	-902,888,027
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Royalty rate = R%	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

Table 8.2: Royalty formula for refined minerals applied to financial information of Gold Fields' South Deep mine (*continued*).

Royalty paid by refiner (Deep mine) (R = R% * G)	R	4,052,701	8,345,851	7,062,054	11,860,746	15,434,002	18,460,501	20,434,500	13,784,500	14,727,500
Operating Profit (Eo) less Royalties (R) = E*	R	86,487,533	397,298,289	216,929,660	685,866,446	932,966,307	1,192,888,629	977,185,514	86,805,508	-69,315,527

Source: Gold Fields Limited (2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

Table 8.3: Royalty formula for refined minerals applied to financial information of Sibanye Gold's Beatrix mine.

	Year / units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	3,590,000	3,215,000	2,991,000	3,051,000	3,817,000	3,368,000	4,091,000	4,546,000	4,319,000
Gold produced and sold	kg	16,903	13,625	12,164	12,188	10,787	8,981	9,722	10,354	10,105
Gold price received	R/kg	157,249	231,750	259,126	287,187	371,772	435,698	433,460	441,018	476,546
Gross Sales Revenue (G)	R	2,657,979,847	3,157,593,750	3,152,008,664	3,500,235,156	4,010,304,564	3,913,003,738	4,214,098,120	4,566,300,372	4,815,497,330
Operating Costs:										
Unit Opex	R/t	432	536	681	745	631	783	732	705	785
Total Operating costs	R	1,550,880,000	1,723,240,000	2,036,871,000	2,272,995,000	2,408,527,000	2,637,144,000	2,994,612,000	3,204,930,000	3,390,415,000
Operating profit before Royalty + Capex = Eo	R	1,107,099,847	1,434,353,750	1,115,137,664	1,227,240,156	1,601,777,564	1,275,859,738	1,219,486,120	1,361,370,372	1,425,082,330
Comment: Tax Shield										

Table 8.3: Royalty formula for refined minerals applied to financial information of Sibanye Gold’s Beatrix mine (*continued*).

Capex	R	- 592,800,000	- 576,600,000	- 629,400,000	- 650,600,000	- 611,100,000	- 658,200,000	- 537,000,000	- 548,000,000	- 596,500,000
EBIT before Royalties after Capex (E)	R	514,299,847	857,753,750	485,737,664	576,640,156	990,677,564	617,659,738	682,486,120	813.370.372	828,582,330
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	19%	27%	15%	16%	25%	16%	16%	18%	17%
Royalty rate = R%	%	2.1%	2.5%	1.7%	1.8%	2.5%	1.8%	1.8%	1.9%	1.9%
Royalty paid by refiner (Shallow mine) (R = R% * G)	R	54,433,887	78,939,844	54,619,056	63,632,388	99,305,728	68,977,798	75,669,380	87,901,132	90,364,073
Operating Profit (Eo) less Royalties (R) = E*	R	1,052,665,960	1,355,413,906	1,060,518,608	1,163,607,768	1,502,471,836	1,206.881,940	1,143,816,740	1,273,469,240	1,334,718,257

Source: Gold Fields Limited (2008, 2009, 2010 and 2011); SibanyeGold (2012, 2013a, 2014a and 2015a); SibanyeGold (2013b, 2014b and 2015b).

Model 2's PGM sector assessment.

Table 8.4: Royalty formula for refined minerals applied to financial information of Amplats' Mogalakwena mine.

	Year / units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes milled	t	4,187,000	7,180,000	9,722,000	10,380,000	10,835,000	10,480,000	11,031,000	11,731,000	11,725,000
Pt produced	oz	162,500	177,400	233,300	272,300	312,800	304,800	342,800	375,400	392,500
Gross Sales Revenue	R	3,421,000,000	3,755,000,000	4,540,000,000	6,187,000,000	8,403,000,000	7,649,000,000	10,086,000,000	13,779,000,000	13,864,000,000
Operating Costs:										
Unit on-mine cost/tonnes milled	R/t	282	288	196	231	254	315	360	437	409
On-mine costs (mining and concentration)	R	1,180,734,000	2,067,840,000	1,905,512,000	2,397,780,000	2,752,090,000	3,301,200,000	3,971,160,000	5,126,447,000	4,795,525,000
Processing (smelting, treatment and refining) costs	R	345,953,500	604,513,600	872,857,700	837,144,000	1,149,151,600	1,341,208,800	1,481,416,800	1,968,613,000	2,074,010,000
Total operating costs	R	1,526,687,500	2,672,353,600	2,778,369,700	3,234,924,000	3,901,241,600	4,642,408,800	5,452,576,800	7,095,060,000	6,869,535,000
Operating profit before Royalty+Capex = Eo	R	1,894,312,500	1,082,646,400	1,761,630,300	2,952,076,000	4,501,758,400	3,006,591,200	4,633,423,200	6,683,940,000	6,994,465,000
Comment: Tax shield										
Capex	R	- 4,143,000,000	- 2,964,000,000	- 1,246,000,000	- 1,350,000,000	- 1,251,000,000	- 1,171,000,000	- 1,960,000,000	- 2,144,000,000	- 1,939,000,000
EBIT before Royalties after Capex (E)	R	- 2,248,687,500	- 1,881,353,600	515,630,300	1,602,076,000	3,250,758,400	1,835,591,200	2,673,423,200	4,539,940,000	5,055,465,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	11%	26%	39%	24%	27%	33%	36%
Royalty rate = R%	%	0.5%	0.5%	1.4%	2.5%	2.5%	2.4%	2.5%	2.5%	2.5%
Royalty paid by refiner (R = R% * G)	R	17,105,000	18,775,000	63,950,424	154,675,000	210,075,000	185,092,296	252,150,000	344,475,000	346,600,000

Table 8.4: Royalty formula for refined minerals applied to financial information of Amplats' Mogalakwena mine (*continued*).

Operating Profit (Eo) less Royalties (R) = E*	R	1,877,207,500	1,063,871,400	1,697,679,876	2,797,401,000	4,291,683,400	2,821,498,904	4,381,273,200	6,339,465,000	6,647,865,000

Source: Anglo Platinum Limited (2008 and 2009); Anglo American Platinum Limited (2012, 2013, 2014 and 2015).

Table 8.5: Royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production Volume	oz	439,350	391,000	422,078	408,570	414,946	334,850	406,497	430,743	442,477
Price Received	$/oz	1,386	1,887	1,044	1,227	1,454	1,322	1,243	1,180	1,099
Exchange rate	R/$	7.2	7.2	9	7.6	7	7.8	8.8	10.4	11.4
Gross Sales revenue (G)	R	4,372,182,738	5,334,416,910	3,979,064,371	3,799,970,656	4,241,420,333	3,443,985,826	4,446,426,785	5,270,829,794	5,553,342,987
Operating Costs:										
Unit opex	R/oz	3,069	4,241	5,174	5,769	6,273	8,748	8,343	9,115	9,168
Total Operating costs	R	1,348,365,150	1,658,231,000	2,183,831,572	2,357,040,330	2,602,956,258	2,929,267,800	3,391,404,471	3,926,222,445	4,056,629,136
Operating profit before Royalty+Capex = Eo	R	3,023,817,588	3,676,185,910	1,795,232,800	1,442,930,326	1,638,464,075	514,718,026	1,055,022,314	1,344,607,350	1,496,713,851
Comment: Tax shield										
Capex	$	35,000,000	48,000,000	31,000,000	26,000,000	50,000,000	64,000,000	45,499,000	38,946,000	35,959,000
Capex redemption	R	- 250,000,000	- 347,000,000	- 281,000,000	- 197,080,000	- 349,000,000	- 495,916,000	- 400,440,000	- 404,002,000	- 410,524,000
EBIT before Royalties after Capex (E)	R	2,773,817,588	3,329,185,910	1,514,232,800	1,245,850,326	1,289,464,075	18,802,026	654,582,314	940,605,350	1,086,189,851
Comment: Royalties										

Table 8.5: Royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine (*continued*).

X=EBIT (E)/Gross Sales Revenue (G)	%	63%	62%	38%	33%	30%	1%	15%	18%	20%
Royalty rate = R%	%	7%	7%	4.7%	4.1%	3.9%	0.6%	2.1%	2.5%	2.7%
Royalty paid by miner-only (R = R% * G)	R	306,052,792	373,409,184	188,143,411	157,427,667	164,480,888	19,309,043	94,963,502	130,865,854	148,454,476
Operating Profit (Eo) less Royalties (R) = E*	R	2,717,764,796	3,302,776,726	1,607,089,388	1,285,502,660	1,473,983,187	495,408,983	960,058,812	1,213,741,494	1,348,259,375

Source: Aquarius Platinum Limited (2007, 2010, 2011 and 2015).

Model 2's Steel_Iron ore sector assessment.

Table 8.6: Royalty formula for refined minerals applied to financial information of AMSA's Flat steel division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	4,231,000	4,084,000	3,428,000	3,814,000	4,060,000	3,554,000	3,229,000	3,586,000	3,145,000
Sales Volume	t	3,928,000	3,412,000	2,858,000	3,348,000	3,424,000	3,141,000	2,771,000	2,981,000	2,678,000
Assumed prices	$/t	659	907	683	809	892	828	782	738	598
Average exchange rate	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	10.8	12.8
Gross Sales revenue (G)	R	18,275,177,120	25,557,862,372	16,484,164,338	19,889,717,378	22,171,810,003	21,356,267,098	20,912,936,512	23,847,761,520	20,417,339,800
Operating Costs:										
Unit production costs	R/t	2,538	4,032	4,070	4,045	4,823	5,064	5,267	5,635	5,729
Total production costs	R	10,738,278,000	16,466,688,000	13,951,960,000	15,427,630,000	19,581,380,000	17,997,989,100	17,006,238,880	20,208,508,540	18,018,459,800
Operating profit before Royalty+Capex = Eo	R	7,536,899,120	9,091,174,372	2,532,204,338	4,462,087,378	2,590,430,003	3,358,277,998	3,906,697,632	3,639,252,980	2,398,880,000
Comment: Tax Shield										
Capex redemption	R	- 1,443,000,000	- 1,035,000,000	- 630,000,000	- 1,147,000,000	- 717,000,000	- 594,000,000	- 835,000,000	- 501,000,000	- 601,000,000
EBIT before Royalties after Capex (E)	R	6,093,899,120	8,056,174,372	1,902,204,338	3,315,087,378	1,873,430,003	2,764,277,998	3,071,697,632	3,138,252,980	1,797,880,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	33%	32%	12%	17%	8%	13%	15%	13%	9%
Royalty rate = R%	%	2.5%	2.5%	1.4%	1.8%	1.2%	1.5%	1.7%	1.6%	1.2%
Royalty paid by refiner (R = R% * G)	R	456,879,428	638,946,559	234,597,169	364,655,577	260,733,450	327,923,575	350,300,493	370,299,046	245,917,099

Table 8.6: Royalty formula for refined minerals applied to financial information of AMSA's Flat steel division (*continued)*.

Operating Profit (Eo) less Royalties (R) = E*	R	7,080,019,692	8,452,227,813	2,297,607,169	4,097,431,801	2,329,696,553	3,030,354,422	3,556,397,139	3,268,953,934	2,152,962,901

Source: ArcelorMittal South Africa Limited (2008, 2009, 2010); ArcelorMittal (2011, 2012, 2013, 2014 and 2015); ArcelorMittal South Africa Limited (2014).

Table 8.7: Royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	34,000,000	34,000,000	39,400,000	41,300,000	38,900,000	33,700,000	30,900,000	35,500,000	31,400,000
Export sales volume	t	24,000,000	24,900,000	34,200,000	36,100,000	37,183,000	31,200,000	27,000,000	27,870,000	27,200,000
Export sales price	$/t	54	88	65	125	157	122	135	97	56
Average exchange rate	R/$	7	8.3	8.4	7.3	7.3	8.2	9.6	10.8	12.8
Export Sales Revenue	R	9,110,880,000	18,077,400,000	18,650,970,000	32,888,544,000	42,390,943,938	31,174,416,000	35,064,900,000	29,277,713,700	19,436,032,000
Domestic sales volume	t	6,500,000	5,600,000	4,000,000	5,000,000	5,000,000	3,500,000	3,900,000	3,830,000	3,000,000
Domestic sales price	R/t	127	136	204	247	462	532	390	398	727
Domestic Sales Revenue	R	825,500,000	761,600,000	816,000,000	1,234,200,000	2,312,050,000	1,863,225,000	1,522,326,000	1,523,803,800	2,181,000,000
Gross Sales Revenue (Total)	R	9,936,380,000	18,839,000,000	19,466,970,000	34,122,744,000	44,702,993,938	33,037,641,000	36,587,226,000	30,801,517,500	21,617,032,000
Operating Costs:										
Unit production costs	R/t	74.3	101.9	98.8	113.7	150.5	197.8	266.9	271.8	310.8
Total Production costs	R	2,526,200,000	3,463,240,000	3,893,902,000	4,695,397,000	5,853,283,000	6,664,175,000	8,248,446,000	9,650,320,000	9,759,120,000
Operating profit before Royalty + Capex = Eo	R	7,410,180,000	15,375,760,000	15,573,068,000	29,427,347,000	38,849,710,938	26,373,466,000	28,338,780,000	21,151,197,500	11,857,912,000
Comment: Tax shield										

Table 8.7: Royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine (*continued*).

Capex	R	- 439,000,000	- 4,683,000,000	- 1,382,000,000	- 1,794,000,000	- 3,126,000,000	- 4,057,000,000	- 5,054,000,000	- 6,132,000,000	- 5,715,000,000
EBIT before Royalties after Capex (E)	R	6,971,180,000	10,692,760,000	14,191,068,000	27,633,347,000	35,723,710,938	22,316,466,000	23,284,780,000	15,019,197,500	6,142,912,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	70%	57%	73%	81%	80%	68%	64%	49%	28%
Royalty rate = R%	%	7%	6.8%	7%	7%	7%	7%	7%	5.9%	3.7%
Royalty paid by miner-only (R = R% * G)	R	695,546,600	1,282,279,444	1,362,687,900	2,388,592,080	3,129,209,576	2,312,634,870	2,561,105,820	1,822,807,310	790,630,938
Operating Profit (Eo) less Royalties (R) = E*	R	6,714,633,400	14,093,480,556	14,210,380,100	27,038,754,920	35,720,501,362	24,060,831,130	25,777,674,180	19,328,390,190	11,067,281,062

Source: Kumba Iron ore (2007, 2008 and 2009); Anglo American Kumba Iron ore (2010, 2011); Anglo American Kumba Iron ore (2012, 2013, 2014 and 2015).

Model 2's coal sector assessment.

Table 8.8: Royalty formula for refined minerals applied to financial information of Sasol's Synfuels (SA) segment.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	7,326,000	7,403,000	7,103,000	7,380,000	7,088,000	7,168,000	7,443,000	7,610,000	7,762,200
Sales volume	t	7,379,000	7,503,000	6,983,000	7,522,000	7,088,000	7,071,000	7,439,000	7,534,000	7,762,200
Gross Sales Revenue	R	28,686,242,726	39,173,630,530	37,330,652,964	33,494,898,083	37,111,823,767	48,346,982,704	57,729,264,646	67,078,876,077	55,149,066,316
Operating Costs:										
Cash costs per production ton	R/t	1,666	1,882	2,473	2,329	2,662	3,085	3,495	3,864	3,713
Total production Cash costs	R	12,205,116,000	13,932,446,000	17,565,719,000	17,188,020,000	18,868,256,000	22,113,280,000	26,013,285,000	29,405,040,000	28,816,934,634
Operating profit before Royalty + Capex = Eo	R	16,481,126,726	25,241,184,530	19,764,933,964	16,306,878,083	18,243,567,767	26,233,702,704	31,715,979,646	37,673,836,077	26,332,131,682
Comment: Tax shield										
Synfuels Capex redemption	R	- 631,000,000	- 720,000,000	- 816,000,000	- 1,445,000,000	- 1,886,000,000	- 2,467,000,000	- 3,339,000,000	- 4,181,000,000	- 3,465,000,000
EBIT before Royalties after Capex (E)	R	15,850,126,726	24,521,184,530	18,948,933,964	14,861,878,083	16,357,567,767	23,766,702,704	28,376,979,646	33,492,836,077	22,867,131,682
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	55%	63%	51%	44%	44%	49%	49%	50%	41%
Royalty rate = R%	%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Royalty paid by refiner (R = R% * G)	R	717,156,068	979,340,763	933,266,324	837,372,452	927,795,594	1,208,674,568	1,443,231,616	1,676,971,902	1,378,726,658

Table 8.8: Royalty formula for refined minerals applied to financial information of Sasol's Synfuels (SA) segment (*continued*).

Operating Profit (Eo) less Royalties (R) = E*	R	15,763,970,658	24,261,843,767	18,831,667,640	15,469,505,631	17,315,772,172	25,025,028,137	30,272,748,030	35,996,864,176	24,953,405,024

Source: Sasol Limited Group (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015a); Sasol Limited (2008, 2011, 2012, 2013, 2014 and 2016); Sasol (2014).

Table 8.9: Royalty formula for unrefined minerals applied to financial information of Anglo American's Thermal coal SA division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exchange rate	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	10.9	12.8
Total Gross Revenue	R	10,842,900,000	18,276,700,000	14,692,270,000	15,442,518,611	19,180,920,000	20,336,170,000	21,104,550,000	22,600,550,000	24,192,540,000
Total Operating costs	R	7,451,850,000	11,544,920,000	10,066,770,000	11,497,038,611	12,632,400,000	15,352,700,000	16,482,200,000	17,577,000,000	19,783,440,000
Operating profit before Royalty + Capex = Eo	R	3,391,050,000	6,731,780,000	4,625,500,000	3,945,480,000	6,548,520,000	4,983,470,000	4,622,350,000	5,023,550,000	4,409,100,000
Comment: Tax Shield										
Capex	$	121,000,000	100,672,000	60,016,000	61,589,000	107,085,000	156,574,000	214,000,000	93,000,000	104,000,000
Capex equivalent	R	853,050,000	832,557,440	504,734,560	450,831,480	777,437,100	1,285,472,540	2065,100,000	1,009,050,000	1,329,120,000
Capex redemption	R	-853,050,000	-832,557,440	-504,734,560	-450,831,480	-777,437,100	-1,285,472,540	-2,065,100,000	-1,009,050,000	-1,329,120,000
EBIT before Royalties after Capex (E)	R	2,538,000,000	5,899,222,560	4,120,765,440	3,494,648,520	5,771,082,900	3,697,997,460	2,557,250,000	4,014,500,000	3,079,980,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	23%	32%	28%	23%	30%	18%	12%	18%	13%
Royalty rate = R%	%	3.1%	4.1%	3.6%	3.0%	3.8%	2.5%	1.8%	2.5%	1.9%

Table 8.9: Royalty formula for unrefined minerals applied to financial information of Anglo American's Thermal coal SA division (*continued*).

Royalty paid by miner-only (R = R% * G)	R	336,214,500	746,852,673	531,324,177	465,506,873	737,136,033	512,569,457	389,661,640	559,058,306	463,182,700
Operating Profit (Eo) less Royalties (R) = E*	R	3,054,835,500	5,984,927,327	4,094,175,823	3,479,973,127	5,811,383,967	4,470,900,543	4,232,688,361	4,464,491,694	3,945,917,300

Source: Anglo American (2008b, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

APPENDIX VIII

Table 8.10: Group Statistics for royalty payments of refined and unrefined minerals producers in the four commodity sectors

Commodity sector	Type of producer	N	Mean of Royalties paid (R)	Std. Deviation	Std. Error Mean
Gold	Refiner (deep mine)	9	12,684,706	5,385,056	1,795,019
	Refiner (shallow mine)	9	77,837,304	16,709,004	5,569,668
PGMs	Refiner	9	201,310,747	152,432,812	50,810,938
	Miner-only	9	175,900,757	106,315,525	35,438,508
Steel_Iron ore	Refiner	9	392,106,707	168,563,590	56,187,864
	Miner-only	9	1,816,166,060	840,491,157	280,163,719
Synfuels_Coal	Refiner	9	1,347,004,793	384,936,637.61	128,312,213
	Miner-only	9	526,834,040	140,027,569	46,675,857

These results were further used in the Levene's Test for Equality of Variances and t-test for Equality of means calculations. The results are presented in Table 8.11.

Table 8.11: Independent Samples Test for royalty payments of refined and unrefined minerals producers in the four commodity sectors

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Gold	Equal variances assumed	11.530	0.004	-11.134	16	.000	-65,152,598	5,851,777	-77,557,811	-52,747,385
	Equal variances not assumed			-11.134	9.644	.000	-65,152,598	5,851,777	-78,256,679	-52,048,517
PGMs	Equal variances assumed	1.717	0.209	0.410	16	.687	25,409,990	61,948,682	-105,915,350	156,735,330
	Equal variances not assumed			0.410	14.294	.688	25,409,990	61,948,682	-107,200,925	158,020,905
Steel_Ion ore	Equal variances assumed	17.334	0.001	-4.984	16	.000	-1,424,059,353	285,742,516	-2,029,806,426	-818,312,279
	Equal variances not assumed			-4.984	8.643	.001	-1,424,059,353	285,742,516	-2,074,552,648	-773,566,057
Synfuels_Coal	Equal variances assumed	11.849	0.003	6.007	16	.000	820,170,753	136,538,125	530,722,859	1,109,618,647
	Equal variances not assumed			6.007	10.081	.000	820,170,753	136,538,125	516,275,044	1,124,066,462

The interpretation of independent samples t-test results for model 2 in terms of Econometric analysis phase 1’s specifications are discussed as follows:

Econometrics analysis phase 1 of Model 2's assessment.

Gold sub-sector:

Step 1:

p-value (Sig.) = 0.004 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by 'refined' gold producer and royalties paid by 'unrefined' gold producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by 'refined' gold producer and royalties paid by 'unrefined' gold producer.

Step 3:

Eta squared (η^2) = $\frac{(-11.134)^2}{(-11.134)^2+(9+9-2)}$ = 0.88568

η^2 = 0.89 to 2 d.p.

Using Cohen's guidelines,

0.89> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the gold sector is as follows:

With the shallow mine (refiner) paying more royalties than the deep-level gold mine (also a refiner), the magnitude of this difference using their average royalty payments for the years of assessment is approximately R65,152,600.

PGM sub-sector:

Step 1:

p-value (Sig.) = 0.209 is greater than 0.05

Therefore, the null hypothesis fails to be rejected, meaning that variances for refined PGM producer and royalties paid by PGM concentrates producer are equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances assumed' row = 0.687 > 0.05

Therefore, the null hypothesis fails to be rejected, meaning that there is no statistically significant difference between refined PGM producer and royalties paid by PGM concentrates producer.

Step 3:

No need to calculate Eta squared (η^2) value since there is no statistically significant difference between refined PGM producer and royalties paid by PGM concentrates producer.

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the PGM sector is as follows:

With more evidence from financial statement and realized beneficiation incentive assessment showing that refiner paid more royalties than the refiner in many of the years of assessment, the magnitude of this difference based on their average royalty payments is approximately R25,410,000.

Steel-Iron ore sub-sector:

Step 1:

p-value (Sig.) = 0.001 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined iron ore (steel) producer and royalties paid by unrefined iron ore producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from ‘Equal variances not assumed’ row = 0.001 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by refined iron ore (steel) producer and royalties paid by unrefined iron ore producer.

Step 3:

Eta squared (η^2) = $\frac{(-4.984)^2}{(-4.984)^2+(9+9-2)}$ = 0.608229

η^2 = 0.61 to 2 d.p.

Using Cohen’s guidelines,

0.61> 0.14 = very large effect

Step 4:

The difference between the mean Rand values of royalty payments of the two classes of producers in the iron ore sector is as follows:

With the miner-only paying more royalties than the refiner, the magnitude of this difference using their average royalty payments for the years of assessment is approximately R1,424,059,400.

Synfuels-Coal sub-sector:

Step 1:

p-value (Sig.) = 0.003 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined Coal (synfuels) producer and royalties paid by unrefined Coal producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference royalties paid by refined Coal (steel) producer and royalties paid by unrefined Coal producer.

Step 3:

Eta squared (η^2) = $\frac{(6.007)^2}{(6.007)^2+(9+9-2)}$ = 0.69280

η^2 = 0.69 to 2 d.p.

Using Cohen's guidelines,

0.69> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the coal sector is as follows:

With the refiner paying more royalties than the miner-only, the magnitude of this difference using their average royalty payments for the years of assessment is R820,170,800.

Econometrics analysis phase 2 of Model 2's assessment.

Realized beneficiation incentive assessment for gold sub-sector

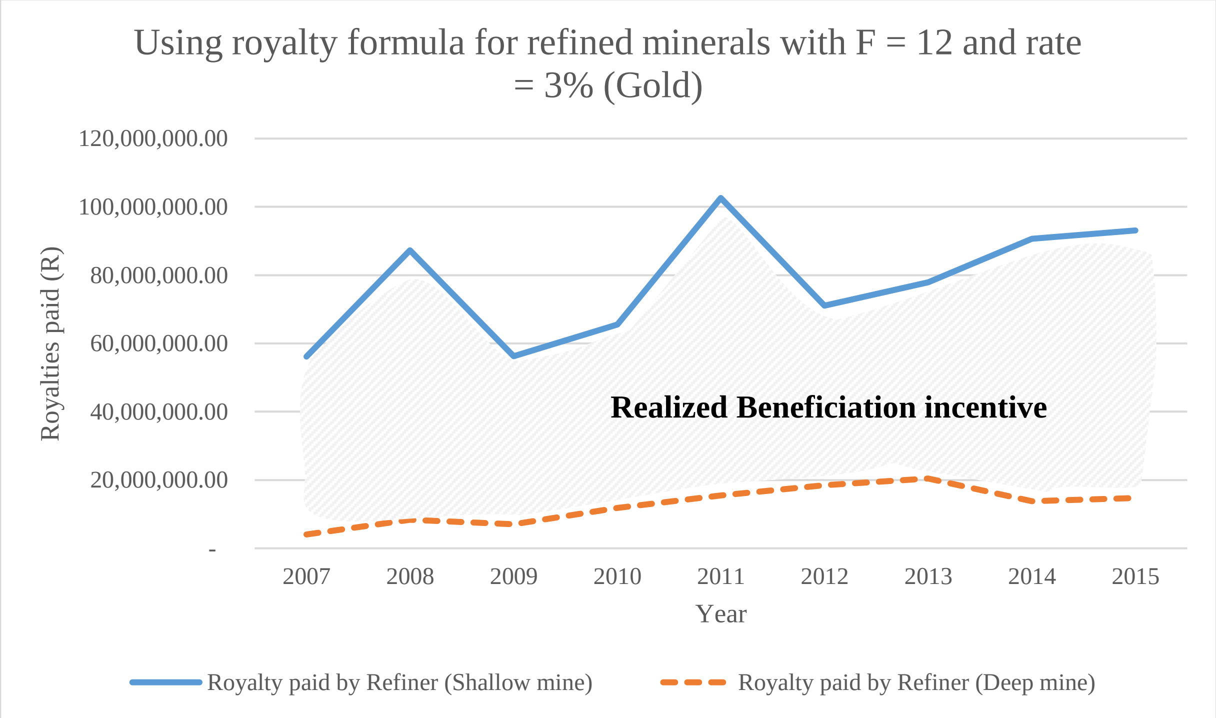

Figure 8.1: Royalty payments for both Gold producers.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.1, it can be observed that the shallow mine gold producer paid a higher penalty in terms of royalty payments. Hence, it there was no case of realized beneficiation incentive in existent here, instead it was the mine that possessed greater revenues that paid greater royalty payments.

Realized beneficiation incentive assessment for PGM sub-sector

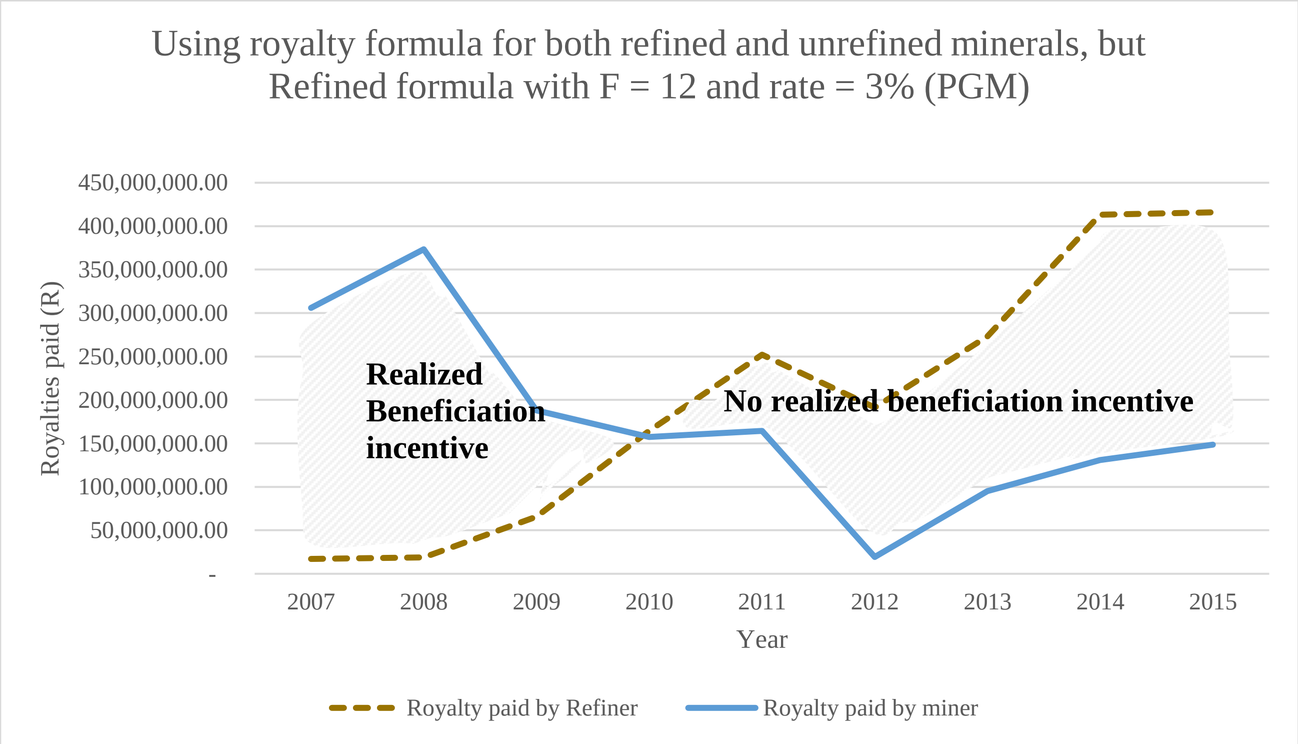

Figure 8.2: Royalty payments for both Refined and Unrefined PGM production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.2, it can be observed that in years 2007 to 2010, the unrefined mineral producer paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments in those 4 years. However, from 2010 onwards, the refined mineral producer paid the higher penalty in terms of royalty payments. This signified a disincentive to the refiner.

Realized beneficiation incentive assessment for Steel-iron ore sub-sector

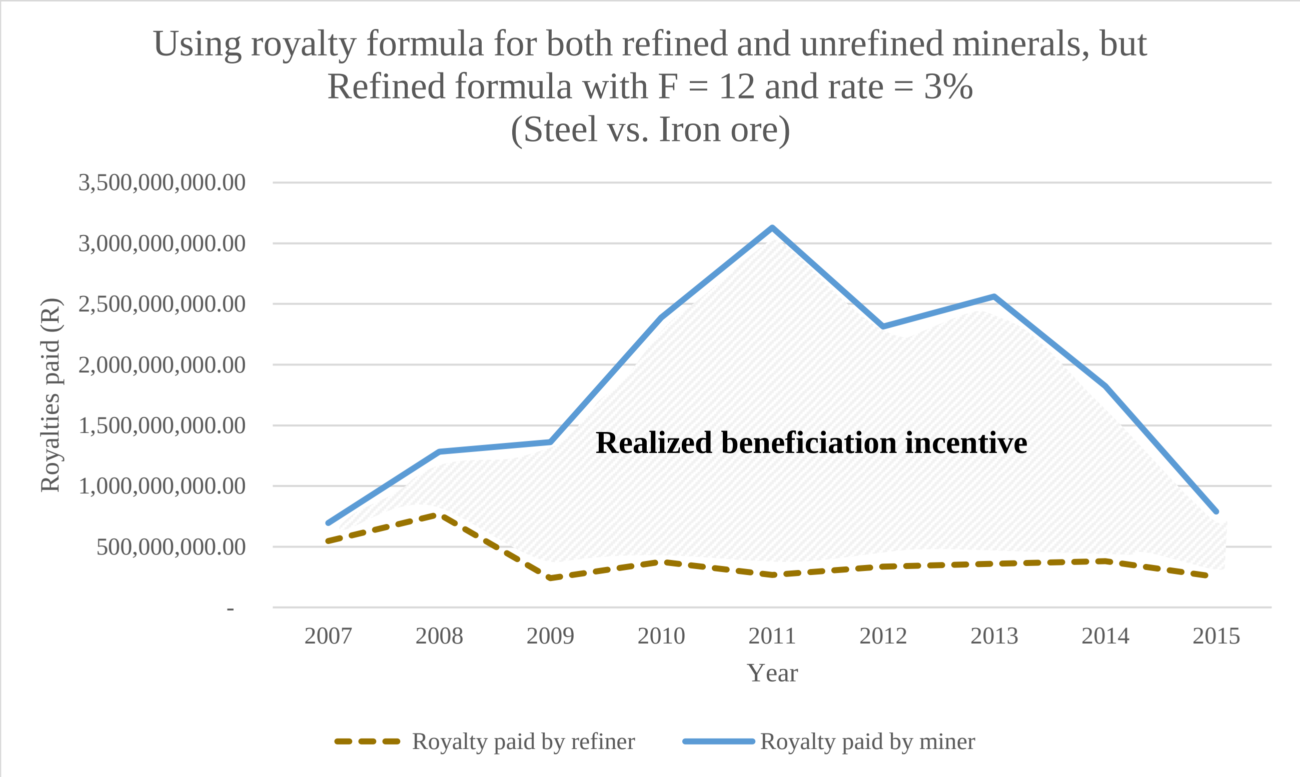

Figure 8.3: Royalty payments for both Refined and Unrefined iron production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.3, it can be observed that the unrefined production paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Realized beneficiation incentive assessment for coal sub-sector

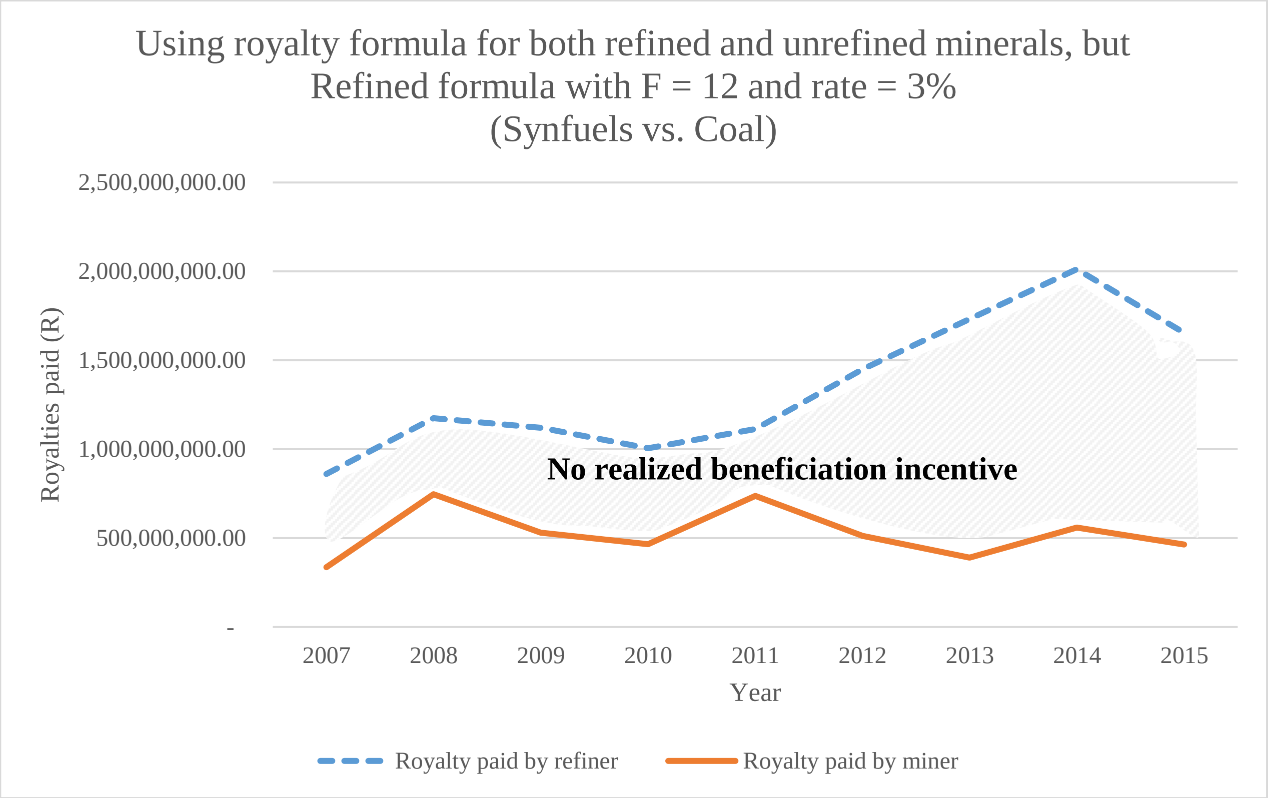

Figure 8.4: Royalty payments for both Refined and Unrefined coal production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.4, it can be observed that the refined production paid a higher penalty in terms of royalty payments, although the magnitude was less than that of model 1. Hence, no realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Table 8.12 provides a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases that were conducted.

Table 8.12: Statement of interpretation of results using tweaked royalty formula for refined minerals, where F = 12, max rate = 3%

Commodity sectors	Results and Observations	Interpretation	Deduction
Gold: South Deep mine (refiner) vs. Beatrix Mine (refiner)	Step 1: p-value (Sig.) = 0.004 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible because of difference in magnitude of royalty payments; 2. However, because of the comparison between two refiners, the royalty rate beneficiation incentive was non-existent.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference	
	Step 3: η2 = 0.89 to 2 d.p. Using Cohen's guidelines, 0.89 > 0.14 = very large effect	The magnitude of difference is very large	
	Step 4:	The difference between the means of royalties paid is R65,152,600.	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner (deep mine) **paid lesser** royalties than refiner (shallow mine), because of the 'poor' profitability of the deep mine in all the years of assessment.	
PGMs: Mogalakwena mine (refiner) vs.	Step 1: p-value (Sig.) = 0.209 < 0.05	Variances are equal	1. Realized beneficiation incentive was possible for only 3 years, but wiped out for the next 6 years; 2. Royalty rate incentive had mixed results but bears more
	Step 2:	There is no statistically significant difference	

Table 8.12: Statement of interpretation of results using tweaked royalty formula for refined minerals, where F = 12, max rate = 3% (*continued*).

Kroondal mine (miner-only)	p-value (Sig. (2-tailed) = 0.687 > 0.05		3. towards no existence of incentive. The indication is that it is better to be a miner-only as the refiner was 'penalized' with its greater royalty payments; 4. The mixed result appears to indicate that the level of refinement does not determine the amount of royalties to be paid. Instead, it is the producer with the greater revenue (whatever the peculiar economic situation of the producer is) that pays greater royalties.
	Step 3: η2 not calculated	The magnitude of difference not calculated since there is no statistically significant difference	
	Step 4:	The difference between the means of royalties paid is R25,410,000.	
	Realized beneficiation incentive assessment:	Refiner paid lesser royalties than miner-only from 2007 to 2010, but from 2010 to 2015, the refiner paid more royalties than the miner-only.	
Steel_Iron ore: ArcelorMittal's Flat steel (refiner) vs. Kumba Iron ore (miner-only)	Step 1: p-value (Sig.) = 0.001 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible because of difference in magnitude of royalty payments; 2. Royalty rate incentive appears to be very functional, especially in 2011 when difference in payments ~ R2.87Bn. In this commodity-case, the miner-only was severely 'penalized' in terms of royalty payments.
	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	There is a statistically significant difference	
	Step 3: η2 = 0.61 to 2 d.p. Using Cohen's guidelines, 0.61> 0.14 = very large effect	The magnitude of difference is very large	
	Step 4:	The difference between the means of royalties paid is R1,424,059,400.	

Table 8.12: Statement of interpretation of results using tweaked royalty formula for refined minerals, where F = 12, max rate = 3% (*continued*)

	Realized beneficiation incentive assessment:	For all the years of assessment, refiner **paid lesser** royalties than miner-only	
Synfuels_Coal: Sasol Synfuels SA (refiner) vs. Anglo Coal SA (miner-only)	Step 1: p-value (Sig.) = 0.003 < 0.05	Variances are not equal	1. Realized beneficiation incentive was not possible; 2. Royalty rate incentive was non-existent as Refiner was 'penalized' with its greater royalty payments.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference	
	Step 3: $\eta 2 = 0.69$ to 2 d.p. Using Cohen's guidelines, 0.69 > 0.14 = very large effect	The magnitude of difference is very large	
	Step 4:	The difference between the means of royalties paid is R820,170,800.	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner **paid more** royalties than miner-only.	

APPENDIX IX

Model 3's Gold sub-sector assessment.

Table 8.13: Royalty formula for refined minerals applied to financial information of Gold Fields' South Deep mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	1,104,000	1,367,000	1,241,000	1,681,000	2,440,000	2,106,000	2,347,000	1,323,000	1,496,000
Gold produced	kg	5,076	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold sold	kg	5,166	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold price received	R/kg	156,899	231,187	259,921	288,022	363,538	438,961	434,915	442,023	478,166
Gross Sales Revenue	R	810,540,234	1,669,170,140	1,412,410,714	2,372,149,192	3,086,800,309	3,692,100,130	4,086,900,014	2,756,900,008	2,945,499,973
Total Operating costs	R	720,000,000	1,263,526,000	1,188,419,000	1,674,422,000	2,138,400,000	2,480,751,000	3,089,280,000	2,656,310,000	3,000,088,000
Operating profit before Royalty + Capex = Eo	R	90,540,234	405,644,140	223,991,714	697,727,192	948,400,309	1,211,349,130	997,620,014	100,590,008	-54,588,027
Comment: Tax Shield										
Capex redemption	R	-283,400,000	-784,700,000	-1,020,500,000	-1,613,300,000	-1,982,400,000	-2,575,800,000	-194,300,000	-994,360,000	-848,300,000
EBIT before Royalties after Capex (E)	R	-192,859,766	-379,055,860	-796,508,286	-915,572,808	-1,033,999,691	-1,364,450,870	-945,679,986	-893,769,992	-902,888,027
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 8.13: Royalty formula for refined minerals applied to financial information of Gold Fields' South Deep mine (*continued*).

Royalty rate = R%	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Royalty paid by refiner (Deep mine) (R = R% * G)	R	4,052,701	8,345,851	7,062,054	11,860,746	15,434,002	18,460,501	20,434,500	13,784,500	14,727,500
Operating Profit (Eo) less Royalties (R) = E*	R	86,487,533	397,298,289	216,929,660	685,866,446	932,966,307	1,192,888,629	977,185,514	86,805,508	-69,315,527

Source: Gold Fields Limited (2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

Table 8.14: Royalty formula for refined minerals applied to financial information of Sibanye Gold's Beatrix mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	3,590,000	3,215,000	2,991,000	3,051,000	3,817,000	3,368,000	4,091,000	4,546,000	4,319,000
Gold produced and sold	kg	16,903	13,625	12,164	12,188	10,787	8,981	9,722	10,354	10,105
Gold price received	R/kg	157,249	231,750	259,126	287,187	371,772	435,698	433,460	441,018	476,546
Gross Sales Revenue (G)	R	2,657,979,847	3,157,593,750	3,152,008,664	3,500,235,156	4,010,304,564	3,913,003,738	4,214,098,120	4,566,300,372	4,815,497,330
Operating Costs:										
Unit Opex	R/t	432	536	681	745	631	783	732	705	785
Total Operating costs	R	1,550,880,000	1,723,240,000	2,036,871,000	2,272,995,000	2,408,527,000	2,637,144,000	2,994,612,000	3,204,930,000	3,390,415,000
Operating profit before Royalty + Capex = Eo	R	1,107,099,847	1,434,353,750	1,115,137,664	1,227,240,156	1,601,777,564	1,275,859,738	1,219,486,120	1,361,370,372	1,425,082,330
Comment: Tax Shield										

Table 8.14: Royalty formula for refined minerals applied to financial information of Sibanye Gold's Beatrix mine (*continued*).

Capex redemption	R	- 592,800,000	- 576,600,000	- 629,400,000	- 650,600,000	- 611,100,000	- 658,200,000	- 537,000,000	- 548,000,000	- 596,500,000
EBIT before Royalties after Capex (E)	R	514,299,847	857,753,750	485,737,664	576,640,156	990,677,564	617,659,738	682,486,120	813,370,372	828,582,330
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	19%	27%	15%	16%	25%	16%	16%	18%	17%
Royalty rate = R%	%	2.1%	2.7%	1.7%	1.8%	2.5%	1.8%	1.8%	1.9%	1.9%
Refined Royalty paid (R = R% * G) (Shallow mine)	R	54,433,887	84,408,269	54,619,056	63,632,388	99,305,728	68,977,798	75,669,380	87,901,132	90,364,073
Operating Profit (Eo) less Royalties (R) = E*	R	1,052,665,960	1,349,945,481	1,060,518,608	1,163,607,768	1,502,471,836	1,206,881,940	1,143,816,740	1,273,469,240	1,334,718,257

Source: Gold Fields Limited (2008, 2009, 2010 and 2011); SibanyeGold (2012, 2013a, 2014a and 2015a); SibanyeGold (2013b, 2014b and 2015b).

Model 3's PGM sub-sector assessment.

Table 8.15: Royalty formula for refined minerals applied to financial information of Amplats' Mogalakwena mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes milled	t	4,187,000	7,180,000	9,722,000	10,380,000	10,835,000	10,480,000	11,031,000	11,731,000	11,725,000
Pt produced	oz	162,500	177,400	233,300	272,300	312,800	304,800	342,800	375,400	392,500
Gross Sales Revenue	R	3,421,000,000	3,755,000,000	4,540,000,000	6,187,000,000	8,403,000,000	7,649,000,000	10,086,000,000	13,779,000,000	13,864,000,000
Operating Costs:										
Unit on-mine cost/tonnes milled	R/t	282	288	196	231	254	315	360	437	409
On-mine costs (mining and concentration)	R	1,180,734,000	2,067,840,000	1,905,512,000	2,397,780,000	2,752,090,000	3,301,200,000	3,971,160,000	5,126,447,000	4,795,525,000
Processing (smelting, treatment and refining) costs	R	345,953,500	604,513,600	872,857,700	837,144,000	1,149,151,600	1,341,208,800	1,481,416,800	1,968,613,000	2,074,010,000
Total operating costs	R	1,526,687,500	2,672,353,600	2,778,369,700	3,234,924,000	3,901,241,600	4,642,408,800	5,452,576,800	7,095,060,000	6,869,535,000
Operating profit before Royalty + Capex = Eo	R	1,894,312,500	1,082,646,400	1,761,630,300	2,952,076,000	4,501,758,400	3,006,591,200	4,633,423,200	6,683,940,000	6,994,465,000
Comment: Tax shield										
Capex redemption	R	- 4,143,000,000	- 2,964,000,000	- 1,246,000,000	- 1,350,000,000	- 1,251,000,000	- 1,171,000,000	- 1,960,000,000	- 2,144,000,000	- 1,939,000,000
EBIT before Royalties after Capex (E)	R	- 2,248,687,500	- 1,881,353,600	515,630,300	1,602,076,000	3,250,758,400	1,835,591,200	2,673,423,200	4,539,940,000	5,055,465,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	11%	26%	39%	24%	27%	33%	36%

Table 8.15: Royalty formula for refined minerals applied to financial information of Amplats' Mogalakwena mine (continued).

Royalty rate = R%	%	0.5%	0.5%	1.4%	2.6%	3.6%	2.4%	2.6%	3.1%	3.4%
Royalty paid by refiner (R = R% * G)	R	17,105,000	18,775,000	63,950,424	159,101,080	302,075,672	185,092,296	264,303,856	432,090,200	473,757,200
Operating Profit (Eo) less Royalties (R) = E*	R	1,877,207,500	1,063,871,400	1,697,679,876	2,792,974,920	4,199,682,728	2,821,498,904	4,369,119,344	6,251,849,800	6,520,707,800

Source: Anglo Platinum Limited (2008 and 2009); Anglo American Platinum Limited (2012, 2013, 2014 and 2015).

Table 8.16: Royalty formula for refined minerals applied to financial information of Aquarius' Kroondal mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production Volume	oz	439,350	391,000	422,078	408,570	414,946	334,850	406,497	430,743	442,477
Price Received	$/oz	1,386	1,887	1,044	1,227	1,454	1,322	1,243	1,180	1,099
Exchange rate	R/$	7.2	7.2	9	7.6	7	7.8	8.8	10.4	11.4
Gross Sales revenue (G)	R	4,372,182,738	5,334,416,910	3,979,064,371	3,799,970,656	4,241,420,333	3,443,985,826	4,446,426,785	5,270,829,794	5,553,342,987
Operating Costs:										
Unit cost	R/oz	3,069	4,241	5,174	5,769	6,273	8,748	8,343	9,115	9,168
Total Operating costs	R	1,348,365,150	1,658,231,000	2,183,831,572	2,357,040,330	2,602,956,258	2,929,267,800	3,391,404,471	3,926,222,445	4,056,629,136
Operating profit before Royalty + Capex = Eo	R	3,023,817,588	3,676,185,910	1,795,232,800	1,442,930,326	1,638,464,075	514,718,026	1,055,022,314	1,344,607,350	1,496,713,851
Comment: Tax shield										
Capex	$	35,000,000	48,000,000	31,000,000	26,000,000	50,000,000	64,000,000	45,499,000	38,946,000	35,959,000
Capex redemption	R	- 250,000,000	- 347,000,000	- 281,000,000	- 197,080,000	- 349,000,000	- 495,916,000	- 400,440,000	- 404,002,000	- 410,524,000

Table 8.16: Royalty formula for refined minerals applied to financial information of Aquarius' Kroondal mine (*continued*).

EBIT before Royalties after Capex (E)	R	2,773,817,588	3,329,185,910	1,514,232,800	1,245,850,326	1,289,464,075	18,802,026	654,582,314	940,605,350	1,086,189,851
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	63%	62%	38%	33%	30%	1%	15%	18%	20%
Royalty rate = R%	%	5%	5%	3.5%	3.1%	2.9%	0.5%	1.7%	1.9%	2.1%
Royalty paid by miner (R = R% * G) (miner)	R	218,609,137	266,720,846	141,033,946	118,667,879	124,364,228	18,724,091	74,598,719	101,602,577	114,661,903
Operating Profit (Eo) less Royalties (R) = E*	R	2,805,208,451	3,409,465,065	1,654,198,853	1,324,262,447	1,514,099,847	495,993,935	980,423,595	1,243,004,772	1,382,051,948

Source: Aquarius Platinum Limited (2007, 2010, 2011 and 2015).

Model 3's Steel-Iron ore sub-sector assessment.

Table 8.17: Royalty formula for refined minerals applied to financial information of AMSA's Flat steel division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	4,231,000	4,084,000	3,428,000	3,814,000	4,060,000	3,554,000	3,229,000	3,586,000	3,145,000
Sales Volume	t	3,928,000	3,412,000	2,858,000	3,348,000	3,424,000	3,141,000	2,771,000	2,981,000	2,678,000
Assumed prices	$/t	659	907	683.4	809.4	892	828.2	782.1	738	597.5
Average exchange rate	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	10.8	12.8
Gross Sales revenue (G)	R	18,275,177,120	25,557,862,372	16,484,164,338	19,889,717,378	22,171,810,003	21,356,267,098	20,912,936,512	23,847,761,520	20,417,339,800
Operating Costs:										
Unit production cost	R/t	2,538	4,032	4,070	4,045	4,823	5,064	5,267	5,635	5729
Total production cost	R	10,738,278,000	16,466,688,000	13,951,960,000	15,427,630,000	19,581,380,000	17,997,989,100	17,006,238,880	20,208,508,540	18,018,459,800
Operating profit before Royalty + Capex = Eo	R	7,536,899,120	9,091,174,372	2,532,204,338	4,462,087,378	2,590,430,003	3,358,277,998	3,906,697,632	3,639,252,980	2,398,880,000
Comment: Tax Shield										
Capex	R	- 1,443,000,000	- 1,035,000,000	- 630,000,000	- 1,147,000,000	- 717,000,000	- 594,000,000	- 835,000,000	- 501,000,000	- 601,000,000
EBIT before Royalties after Capex (E)	R	6,093,899,120	8,056,174,372	1,902,204,338	3,315,087,378	1,873,430,003	2,764,277,998	3,071,697,632	3,138,252,980	1,797,880,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	33%	32%	12%	17%	8%	13%	15%	13%	9%
Royalty rate = R%	%	3.2%	3%	1.4%	1.8%	1.2%	1.5%	1.7%	1.6%	1.2%

Table 8.17: Royalty formula for refined minerals applied to financial information of AMSA's Flat steel division (*continued*).

Royalty paid by refiner (R = R% * G)	R	578,887,815	772,283,262	234,597,169	364,655,577	260,733,450	327,923,575	350,300,493	370,299,046	245,917,099
Operating Profit (Eo) less Royalties (R) = E*	R	6,958,011,305	8,318,891,110	2,297,607,170	4,097,431,801	2,329,696,553	3,030,354,422	3,556,397,139	3,268,953,934	2,152,962,901

Source: ArcelorMittal South Africa Limited (2008, 2009, 2010); ArcelorMittal (2011, 2012, 2013, 2014 and 2015); ArcelorMittal South Africa Limited (2014).

Table 8.18: Royalty formula for refined minerals applied to financial information of Kumba Iron ore's Sishen mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	34,000,000	34,000,000	39,400,000	41,300,000	38,900,000	33,700,000	30,900,000	35,500,000	31,400,000
Export sales volume	t	24,000,000	24,900,000	34,200,000	36,100,000	37,183,000	31,200,000	27,000,000	27,870,000	27,200,000
Export sales price	$/t	54	88	65	124.8	157.3	122	135	97	56
Average exchange rate	R/$	7	8.3	8.4	7.3	7.3	8.2	9.6	10.8	12.8
Export Sales Revenue	R	9,110,880,000	18,077,400,000	18,650,970,000	32,888,544,000	42,390,943,938	31,174,416,000	35,064,900,000	29,277,713,700	19,436,032,000
Domestic sales volume	t	6,500,000	5,600,000	4,000,000	5,000,000	5,000,000	3,500,000	3,900,000	3,830,000	3,000,000
Domestic sales price	R/t	127	136	204	247	462	532	390	398	727
Domestic Sales Revenue	R	825,500,000	761,600,000	816,000,000	1,234,200,000	2,312,050,000	1,863,225,000	1,522,326,000	1,523,803,800	2,181,000,000
Gross Sales Revenue (Total)	R	9,936,380,000	18,839,000,000	19,466,970,000	34,122,744,000	44,702,993,938	33,037,641,000	36,587,226,000	30,801,517,500	21,617,032,000
Operating Costs:										
Unit production cost	R/t	74.3	102	98.8	113.7	150.5	197.8	267	271.8	310.8

Table 8.18: Royalty formula for refined minerals applied to financial information of Kumba Iron ore's Sishen mine (*continued*).

Total Production costs	R	2,526,200,000	3,463,240,000	3,893,902,000	4,695,397,000	5,853,283,000	6,664,175,000	8,248,446,000	9,650,320,000	9,759,120,000
Operating profit before Royalty + Capex = Eo	R	7,410,180,000	15,375,760,000	15,573,068,000	29,427,347,000	38,849,710,938	26,373,466,000	28,338,780,000	21,151,197,500	11,857,912,000
Comment: Tax shield										
Capex redemption	R	-439,000,000	-4,683,000,000	-1,382,000,000	-1,794,000,000	-3,126,000,000	-4,057,000,000	-5,054,000,000	-6,132,000,000	-5,715,000,000
EBIT before Royalties after Capex (E)	R	6,971,180,000	10,692,760,000	14,191,068,000	27,633,347,000	35,723,710,938	22,316,466,000	23,284,780,000	15,019,197,500	6,142,912,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	70%	57%	73%	81%	80%	68%	64%	49%	28%
Royalty rate = R%	%	5%	5%	5%	5%	5%	5%	5%	4.4%	2.8%
Royalty paid by miner (R = R% * G)	R	496,819,000	941,950,000	973,348,500	1,706,137,200	2,235,149,697	1,651,882,050	1,829,361,300	1,355,543,388	599,518,120
Operating Profit (Eo) less Royalties (R) = E*	R	6,913,361,000	14,433,810,000	14,599,719,500	27,721,209,800	36,614,561,241	24,721,583,950	26,509,418,700	19,795,654,113	11,258,393,880

Source: Kumba Iron ore (2007, 2008 and 2009); Anglo American Kumba Iron ore (2010, 2011); Anglo American Kumba Iron ore (2012, 2013, 2014 and 2015).

Model 3's coal sub-sector assessment.

Table 8.19: Royalty formula for refined minerals applied to financial information of Sasol's Synfuels (SA) segment.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	7,326,000	7,403,000	7,103,000	7,380,000	7,088,000	7,168,000	7,443,000	7,610,000	7,762,200
Sales volume	t	7,379,000	7,503,000	6,983,000	7,522,000	7,088,000	7,071,000	7,439,000	7,534,000	7,762,200
Gross Sales Revenue	R	28,686,242,726	39,173,630,530	37,330,652,964	33,494,898,083	37,111,823,767	48,346,982,704	57,729,264,646	67,078,876,077	55,149,066,316
Operating Costs:										
Cash costs per production ton	R/t	1,666	1,882	2,473	2,329	2,662	3,085	3,495	3,864	3,713
Total production Cash costs	R	12,205,116,000	13,932,446,000	17,565,719,000	17,188,020,000	18,868,256,000	22,113,280,000	26,013,285,000	29,405,040,000	28,816,934,634
Operating profit before Royalty + Capex = Eo	R	16,481,126,726	25,241,184,530	19,764,933,964	16,306,878,083	18,243,567,767	26,233,702,704	31,715,979,646	37,673,836,077	26,332,131,682
Comment: Tax shield										
Synfuel Capex redemption	R	- 631,000,000	- 720,000,000	- 816,000,000	- 1,445,000,000	- 1,886,000,000	- 2,467,000,000	- 3,339,000,000	- 4,181,000,000	- 3,465,000,000
EBIT before Royalties after Capex (E)	R	15,850,126,726	24,521,184,530	18,948,933,964	14,861,878,083	16,357,567,767	23,766,702,704	28,376,979,646	33,492,836,077	22,867,131,682
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	55%	63%	51%	44%	44%	49%	49%	50%	41%
Royalty rate = R%	%	4.9%	5%	4.6%	4.1%	4%	4.4%	4.4%	4.5%	3.8%

Table 8.19: Royalty formula for refined minerals applied to financial information of Sasol's Synfuels (SA) segment (*continued*).

Royalty paid by refiner (R = R% * G)	R	1,411,441,352	1,958,681,527	1,702,567,982	1,356,424,737	1,494,164,540	2,143,071,130	2,558,804,695	3,014,821,267	2,105,115,866
Operating Profit (Eo) less Royalties (R) = E*	R	15,069,685,375	23,282,503,004	18,062,365,982	14,950,453,346	16,749,403,226	24,090,631,574	29,157,174,951	34,659,014,811	24,227,015,816

Source: Sasol Limited Group (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015a); Sasol Limited (2008, 2011, 2012, 2013, 2014 and 2016); Sasol (2014).

Table 8.20: Royalty formula for refined minerals applied to financial information of Anglo American's Thermal coal SA division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exchange rate	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	11	12.8
Final Revenue	R	10,842,900,000	18,276,700,000	14,692,270,000	15,442,518,611	19,180,920,000	20,336,170,000	21,104,550,000	22,600,550,000	24,192,540,000
Total Operating costs	R	7,451,850,000	11,544,920,000	10,066,770,000	11,497,038,611	12,632,400,000	15,352,700,000	16,482,200,000	17,577,000,000	19,783,440,000
Operating profit before Royalty + Capex = Eo	R	3,391,050,000	6,731,780,000	4,625,500,000	3,945,480,000	6,548,520,000	4,983,470,000	4,622,350,000	5,023,550,000	4,409,100,000
Comment: Tax Shield										
Capex	$	121,000,000	100,672,000	60,016,000	61,589,000	107,085,000	156,574,000	214,000,000	93,000,000	104,000,000
Capex equivalent	R	853,050,000	832,557,440	504,734,560	450,831,480	777,437,100	1,285,472,540	2,065,100,000	1,009,050,000	1,329,120,000
Capex redemption	R	-853,050,000	-832,557,440	-504,734,560	-450,831,480	-777,437,100	-1,285,472,540	-2,065,100,000	-1,009,050,000	-1,329,120,000
EBIT before Royalties after Capex (E)	R	2,538,000,000	5,899,222,560	4,120,765,440	3,494,648,520	5,771,082,900	3,697,997,460	2,557,250,000	4,014,500,000	3,079,980,000
Comment: Royalties										

Table 8.20: Royalty formula for refined minerals applied to financial information of Anglo American's Thermal coal SA division (*continued*).

X=EBIT (E)/Gross Sales Revenue (G)	%	23%	32%	28%	23%	30%	18%	12%	18%	13%
Royalty rate = R%	%	2.4%	3.1%	2.7%	2.3%	2.9%	2%	1.5%	1.9%	1.5%
Royalty paid by miner (R = R% * G)	R	257,254,500	563,321,305	403,122,585	356,784,475	557,591,232	397,520,647	310,102,750	434,162,750	367,361,100
Operating Profit (Eo) less Royalties (R) = E*	R	3,133,795,500	6,168,458,695	4,222,377,415	3,588,695,525	5,990,928,768	4,585,949,353	4,312,247,250	4,589,387,250	4,041,738,900

Source: Anglo American (2008b, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

APPENDIX X

Table 8.21: Group Statistics for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

Commodity sector	Type of producer	N	Mean of Royalties paid (R)	Std. Deviation	Std. Error Mean
Gold	Refiner (deep mine)	9	12,684,706	5,385,056	1,795,019
	Refiner (shallow mine)	9	75,479,079	16,140,003	5,380,001
PGMs	Refiner	9	212,916,748	169,026,345	56,342,115
	Miner-only	9	130,998,147	73,578,555	24,526,185
Steel_Iron ore	Refiner	9	389,510,832	176,740,173	58,913,391
	Miner-only	9	1,309,967,695	593,334,139	197,778,046
Synfuels_Coal	Refiner	9	1,971,677,011	555,996,492	185,332,164
	Miner-only	9	405,246,816	102,368,664	34,122,888

These results were further used in the Levene's Test for Equality of Variances and t-test for Equality of means calculations. The results are presented in Table 8.22.

Table 8.22: Independent Samples Test for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Gold	Equal variances assumed	11.085	.004	-11.072	16	.000	-62,794,373	5,671,552	-74817,,527	-50,771,220
	Equal variances not assumed			-11.072	9.759	.000	-62,794,373	5,671,552	-75,473,750	-50,114,996
PGMs	Equal variances assumed	6.967	.018	1.333	16	.201	81,918,600	61,448,903	-48,347,255	212,184,455
	Equal variances not assumed			1.333	10.927	.210	81,918,600	61,448,903	-53,440,153	217,277,353
Steel_iron ore ore	Equal variances assumed	13.656	.002	-4.460	16	.000	-920,456,863	206,366,042	-1,357,933,329	-482,980,397
	Equal variances not assumed			-4.460	9.409	.001	-920,456,863	206,366,042	-1,384,217,079	-456,696,647
Synfuels_Coal	Equal variances assumed	10.760	.005	8.312	16	.000	1,566,430,195	188,447,294	1,166,939,778	1,965,920,611
	Equal variances not assumed			8.312	8.542	.000	1,566,430,195	188,447,294	1,136,621,102	1,996,239,287

The interpretation of independent samples t-test results for model 4 in terms of Econometric analysis phase 1's specifications are discussed as follows:

Econometric analysis phase 1 of Model 3's assessment.

<u>Gold sub-sector</u>:

Step 1:

p-value (Sig.) = 0.004 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for 'refined' gold producer and royalties paid by 'unrefined' gold producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between 'refined' gold producer and royalties paid by 'unrefined' gold producer.

Step 3:

Eta squared (η^2) = $\frac{(-11.072)^2}{(-11.072)^2+(9+9-2)}$ = 0.8845509

η^2 = 0.89 to 2 d.p.

Using Cohen's guidelines,

0.89> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the gold sector is as follows:

With the shallow mine (refiner) paying more royalties than the deep-level gold mine (also a refiner), the magnitude of this difference using their average royalty payments for the years of assessment is R62,794,373.

<u>PGM sub-sector</u>:

Step 1:

p-value (Sig.) = 0.018 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for refined PGM producer and royalties paid by PGM concentrates producer **are not** equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.210 > 0.05

Therefore, the null hypothesis fails to be rejected, meaning that there is no statistically significant difference between royalties paid by refined PGM producer and royalties by PGM concentrates producer.

Step 3:

No need to calculate Eta squared (η^2) value since there is no statistically significant difference between refined PGM producer and royalties paid by PGM concentrates producer.

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the PGM sector is as follows:

With more evidence from financial statement and realized beneficiation incentive assessment showing that refiner paid more royalties than the refiner in many of the years of assessment, the magnitude of this difference based on their average royalty payments is R81,918,600.

Steel-iron ore sub-sector:

Step 1:

p-value (Sig.) = 0.002 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for refined iron ore (steel) producer and royalties paid by unrefined iron ore producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from ‘Equal variances not assumed’ row = 0.001 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between refined iron ore (steel) producer and royalties paid by unrefined iron ore producer.

Step 3:

Eta squared (η^2) = $\frac{(-4.460)^2}{(-4.460)^2+(9+9-2)}$ = 0.554213242

η^2 = 0.55 to 2 d.p.

Using Cohen’s guidelines,

0.55> 0.14 = very large effect

Step 4:

The difference between the mean Rand values of royalty payments of the two classes of producers in the iron ore sector is as follows:

With the miner-only paying more royalties than the refiner, the magnitude of this difference using their average royalty payments for the years of assessment is R920,456,863.

Synfuels-Coal sub-sector:

Step 1:

p-value (Sig.) = 0.005 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for refined Coal (synfuels) producer and royalties paid by unrefined Coal producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between refined Coal (synfuels) producer and royalties paid by unrefined Coal producer.

Step 3:

Eta squared (η^2) = $\frac{(8.312)^2}{(8.312)^2+(9+9-2)}$ = 0.81196235

η^2 = 0.81 to 2 d.p.

Using Cohen's guidelines,

0.81> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the coal sector is as follows:

With the refiner paying more royalties than the miner-only, the magnitude of this difference using their average royalty payments for the years of assessment is R R1,566,430,195.

Econometrics analysis phase 2 of Model 3's assessment.

Realized beneficiation incentive assessment for gold sub-sector

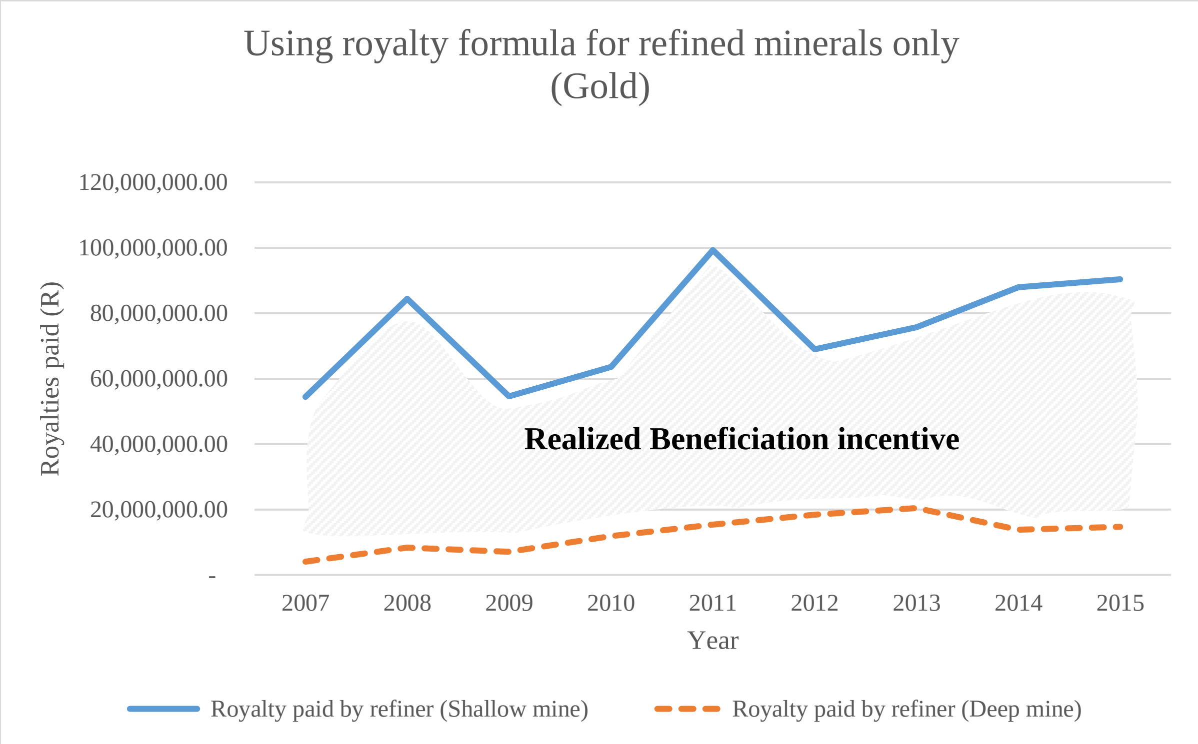

Figure 8.5: Royalty payments for both Gold producers.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.5, it can be observed that the shallow mine gold producer still paid a higher penalty in terms of royalty payments. However, the magnitude of these higher royalty payments was more than in model 2 (same as model 1's second gold sub-sector assessment in Appendix VI). Hence, there was no case of realized beneficiation incentive in existence here again; instead, it was the mine that possessed greater revenues that paid greater royalty payments.

Realized beneficiation incentive assessment for PGM sub-sector

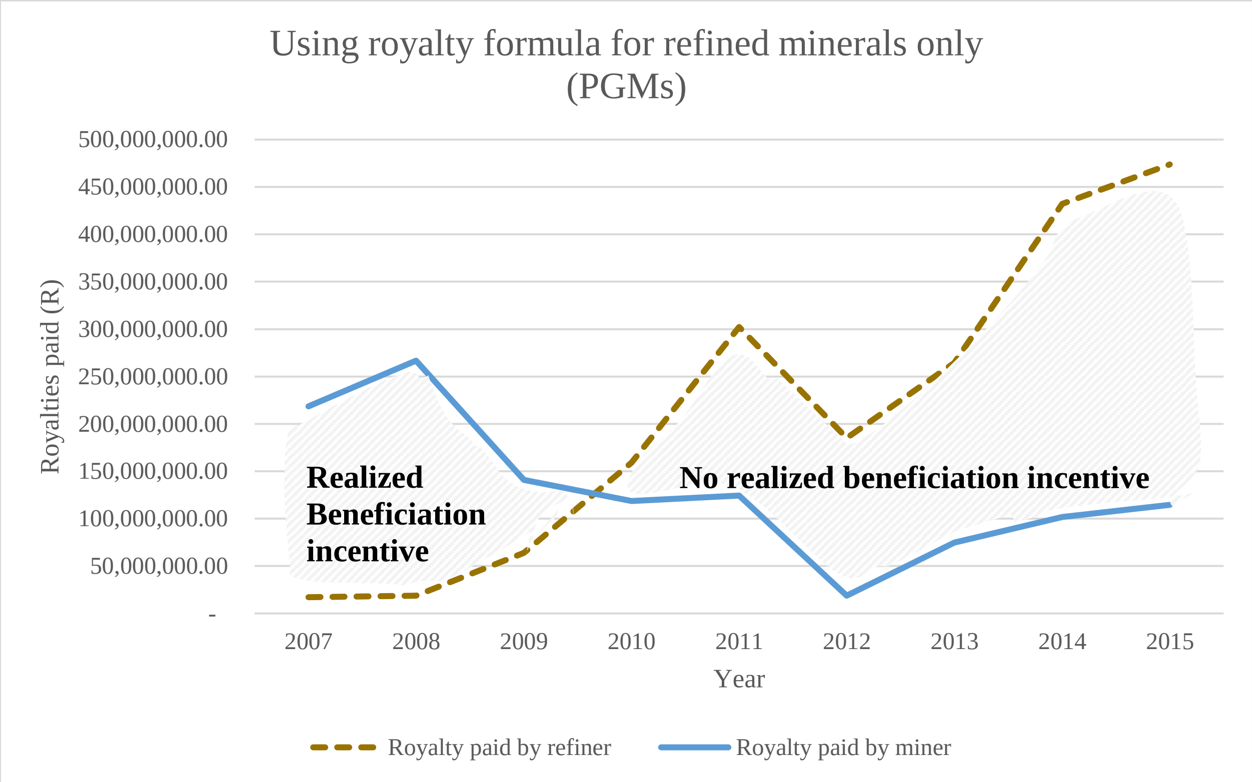

Figure 8.6: Royalty payments for both Refined and Unrefined PGM production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.6, it can be observed that in years 2007 to 2009, the unrefined mineral producer paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments in those 3 years. However, from 2010 onwards, the refined mineral producer paid the higher penalty in terms of royalty payments, just like in other models. This signified a disincentive to the refiner.

Realized beneficiation incentive assessment for steel-iron ore sub-sector

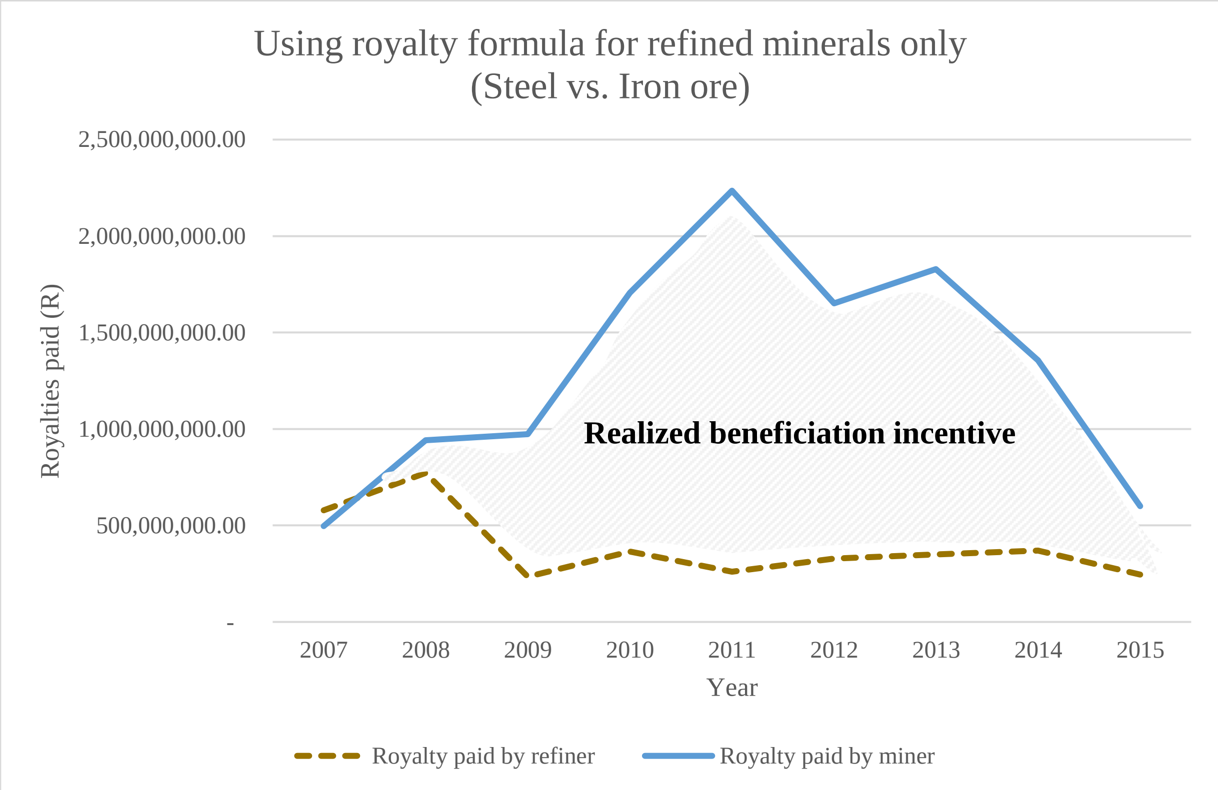

Figure 8.7: Royalty payments for both Refined and Unrefined iron production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.7, it can be observed that the refined production paid higher royalties in 2007. However, from 2008 onwards, unrefined production paid a higher penalty in terms of royalty payments. The magnitude of this royalty penalty through higher royalty payments was much less than in models 1 and 2. Hence, it appeared that some realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Realized beneficiation incentive assessment for coal sub-sector

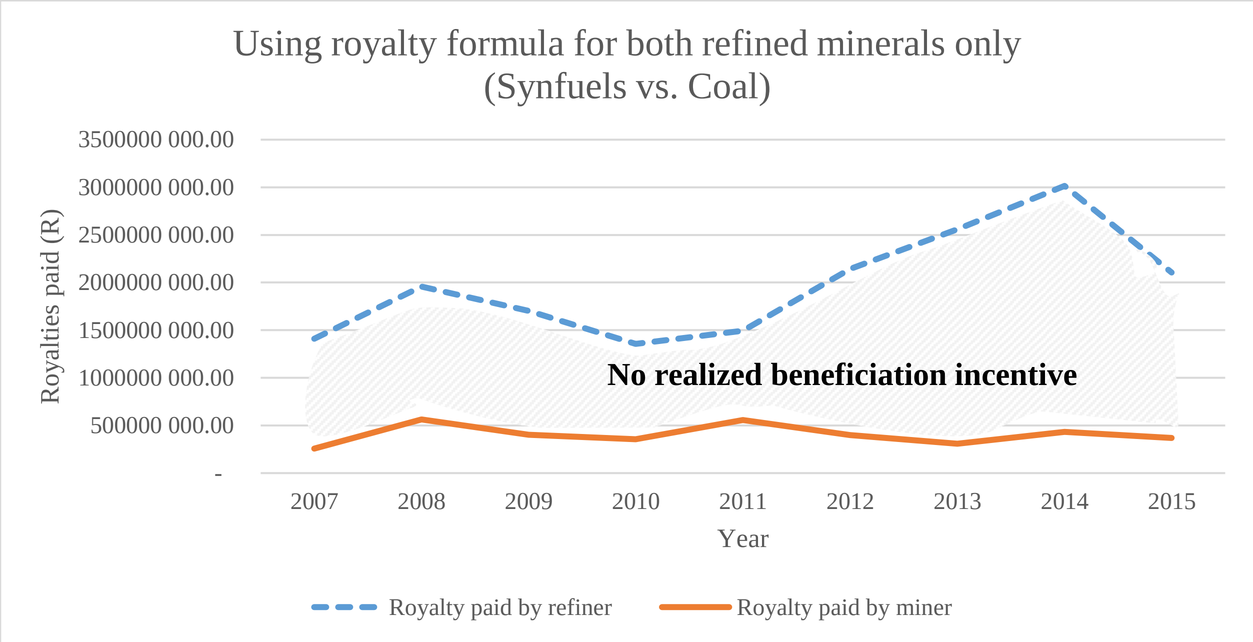

Figure 8.8: Royalty payments for both Refined and Unrefined coal production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.8, it can be observed that the refined production paid a higher penalty in terms of royalty payments, although the magnitude was more than that of model 2. Hence, no realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Table 8.23 provides a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases that were conducted.

Table 8.23: Statement of interpretation of results using royalty formula for refined minerals only.

Commodity sectors	Results and observations	Interpretation	Deduction
Gold: South Deep mine (Refiner) vs. Beatrix Mine (Refiner)	Step 1: p-value (Sig.) = 0.004 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of refinement; 2. Royalty rate incentive is not applicable here, as it was the producer with the greater revenue (whatever the peculiar economic situation of the producer is) that paid greater royalties; 3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference	
	Step 3: $\eta 2$ = 0.89 to 2 d.p. Using Cohen's guidelines, 0.89> 0.14 = very large effect	The magnitude of difference is very large	
	Step 4:	The difference between the means of royalties paid is R62,794,373.	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner (deep mine) **paid lesser** royalties than refiner (shallow mine)	
PGMs: Mogalakwena mine (refiner) vs. Kroondal mine (miner-only)	Step 1: p-value (Sig.) = 0.018 < 0.05	Variances are not equal	1. Realized beneficiation incentive based on profitability performance for refiner occurred in only 3 years, but wiped out for the next 6 years; 2. Realized beneficiation incentive had mixed results but bears more towards no savings
	Step 2: p-value (Sig. (2-tailed) = 0.210 > 0.05	There is no statistically significant difference	

Table 8.23: Statement of interpretation of results using royalty formula for refined minerals only (*continued*).

	Step 3: η2 not calculated	The magnitude of difference not calculated because there is no statistically significant difference	(better to be a Miner-only as refiner was 'penalized'); 3. The mixed result appears to support gold sector case, due to indication that the level of refinement did not really have any bearing on the amount of royalties paid. Instead, it was the producer with the greater revenue that paid greater royalties; 4. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 4:	The difference between the means of royalties paid is R81,918,600.	
	Realized beneficiation incentive assessment:	Refiner paid lesser royalties than miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more royalties than the miner-only (but magnitude of miner-only's payment is lesser than when unrefined royalty formula was applied).	
Steel_Iron ore: ArcelorMittal Flat steel (refiner) vs. Kumba Iron ore (miner-only)	Step 1: p-value (Sig.) = 0.002 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of refinement; 2. Royalty rate incentive is not applicable here, as it was the producer with the greater revenue that paid greater royalties; 3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	There is a statistically significant difference	
	Step 3: η2 = 0.55 to 2 d.p. Using Cohen's guidelines, 0.55> 0.14 = very large effect	The magnitude of difference is very large	

Table 8.23: Statement of interpretation of results using royalty formula for refined minerals only (*continued*).

	Step 4:	The difference between the means of royalties paid is R920,456,863.	
	Realized beneficiation incentive assessment:	1. In 2009, the refiner paid **more** royalties than the miner-only; 2. For all other years of assessment, refiner **paid lesser** royalties than miner-only	
Synfuels_Coal: Sasol Synfuels SA (refiner) vs. Anglo Coal SA (miner-only)	Step 1: p-value (Sig.) = 0.005 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of refinement; 2. Royalty rate incentive is not applicable here, as it was the producer with the greater revenue that paid greater royalties; 3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference	
	Step 3: $\eta 2$ = 0.81 to 2 d.p. Using Cohen's guidelines, 0.81> 0.14 = very large effect	The magnitude of difference is very large	
	Step 4:	The difference between the means of royalties paid is R1,566,430,195.	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner paid **more** royalties than miner-only	

APPENDIX XI

Model 4’s Gold sub-sector assessment.

Table 8.24: Royalty formula for unrefined minerals applied to financial information of Gold Fields’ South Deep mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	1,104,000	1,367,000	1,241,000	1,681,000	2,440,000	2,106,000	2,347,000	1,323,000	1,496,000
Gold produced	kg	5,076	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold sold	kg	5,166	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold price received	R/kg	156,899	231,187	259,921	288,022	363,538	438,961	434,915	442,023	478,166
Gross Sales Revenue	R	810,540,234	1,669,170,140	1,412,410,714	2,372,149,192	3,086,800,309	3,692,100,130	4,086,900,014	2,756,900,008	2,945,499,973
Total Operating costs	R	720,000,000	1,263,526,000	1,188,419,000	1,674,422,000	2,138,400,000	2,480,751,000	3,089,280,000	2,656,310,000	3,000,088,000
Operating profit before Royalty + Capex = Eo	R	90,540,234	405,644,140	223,991,714	697,727,192	948,400,309	1,211,349,130	997,620,014	100,590,008	-54,588,027
Comment: Tax Shield										
Capex redemption	R	-283,400,000	-784,700,000	-1,020,500,000	-1,613,300,000	-1,982,400,000	-2,575,800,000	-1,943,300,000	-994,360,000	-848,300,000
EBIT before Royalties after Capex (E)	R	-192,859,766	-379,055,860	-796,508,286	-915,572,808	-1,033,999,691	-1,364,450,870	-945,679,986	-893,769,992	-902,888,027
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Royalty rate = R%	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

Table 8.24: Royalty formula for unrefined minerals applied to financial information of Gold Fields' South Deep mine (*continued*).

Royalty paid by refiner (Deep mine) (R = R% * G)	R	4,052,701	8,345,851	7,062,054	11,860,746	15,434,002	18,460,501	20,434,500	13,784,500	14,727,500
Operating Profit (Eo) less Royalties (R) = E*	R	86,487,533	397,298,289	216,929,660	685,866,446	932,966,307	1,192,888,629	977,185,514	86,805,508	-69,315,527

Source: Gold Fields Limited (2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

Table 8.25: Royalty formula for unrefined minerals applied to financial information of Sibanye Gold's Beatrix mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	3,590,000	3,215,000	2,991,000	3,051,000	3,817,000	3,368,000	4,091,000	4,546,000	4,319,000
Gold produced and sold	kg	16,903	13,625	12,164	12,188	10,787	8,981	9,722	10,354	10,105
Gold price received	R/kg	157,249	231,750	259,126	287,187	371,772	435,698	433,460	441,018	476,546
Gross Sales Revenue (G)	R	2,657,979,847	3,157,593,750	3,152,008,664	3,500,235,156	4,010,304,564	3,913,003,738	4,214,098,120	4,566,300,372	4,815,497,330
Operating Costs:										
Unit Opex	R/t	432	536	681	745	631	783	732	705	785
Total Operating costs	R	1,550,880,000	1,723,240,000	2,036,871,000	2,272,995,000	2,408,527,000	2,637,144,000	2,994,612,000	3,204,930,000	3,390,415,000
Operating profit before Royalty + Capex = Eo	R	1,107,099,847	1,434,353,750	1,115,137,664	1,227,240,156	1,601,777,564	1,275,859,738	1,219,486,120	1,361,370,372	1,425,082,330
Comment: Tax Shield										
Capex redemption	R	-592,800,000	-576,600,000	-629,400,000	-650,600,000	-611,100,000	-658,200,000	-537,000,000	-548,000,000	-596,500,000

Table 8.25: Royalty formula for unrefined minerals applied to financial information of Sibanye Gold's Beatrix mine (*continued*).

EBIT before Royalties after Capex (E)	R	514,299,847	857,753,750	485,737,664	576,640,156	990,677,564	617,659,738	682,486,120	813,370,372	828,582,330
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	19%	27%	15%	16%	25%	16%	16%	18%	17%
Royalty rate = R%	%	2.7%	3.5%	2.2%	2.3%	3.2%	2.3%	2.3%	2.5%	2.4%
Royalty paid by refiner (shallow mine) (R = R% * G)	R	70,434,327	111,093,941	69,730,895	81,572,304	130,126,808	88,193,879	96,902,282	113,205,988	116,142,190
Operating Profit (Eo) less Royalties (R) = E*	R	1,036,665,520	1,323,259,809	1,045,406,769	1,145,667,852	1,471,650,756	1,187,665,860	1,122,583,838	1,248,164,384	1,308,940,140

Source: Gold Fields Limited (2008, 2009, 2010 and 2011); SibanyeGold (2012, 2013a, 2014a and 2015a); SibanyeGold (2013b, 2014b and 2015b).

Model 4's PGM sub-sector assessment.

Table 8.26: Royalty formula for unrefined minerals applied to financial information of Amplats' Mogalakwena mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes milled	t	4,187,000	7,180,000	9,722,000	10,380,000	10,835,000	10,480,000	11,031,000	11,731,000	11,725,000
Pt produced	oz	162,500	177,400	233,300	272,300	312,800	304,800	342,800	375,400	392,500
Gross Sales Revenue	R	3,421,000,000	3,755,000,000	4,540,000,000	6,187,000,000	8,403,000,000	7,649,000,000	10,086,000,000	13,779,000,000	13,864,000,000
Operating Costs:										
Unit on-mine cost/tonnes milled	R/t	282	288	196	231	254	315	360	437	409
On-mine costs (mining and concentration)	R	1,180,734,000	2,067,840,000	1,905,512,000	2,397,780,000	2,752,090,000	3,301,200,000	3,971,160,000	5,126,447,000	4,795,525,000
Processing (smelting, treatment and refining) costs	R	345,953,500	604,513,600	872,857,700	837,144,000	1,149,151,600	1,341,208,800	1,481,416,800	1,968,613,000	2,074,010,000
Total operating costs	R	1,526,687,500	2,672,353,600	2,778,369,700	3,234,924,000	3,901,241,600	4,642,408,800	5,452,576,800	7,095,060,000	6,869,535,000
Operating profit before Royalty + Capex = Eo	R	1,894,312,500	1,082,646,400	1,761,630,300	2,952,076,000	4,501,758,400	3,006,591,200	4,633,423,200	6,683,940,000	6,994,465,000
Comment: Tax shield										
Capex redemption	R	-4,143,000,000	-2,964,000,000	-1,246,000,000	-1,350,000,000	-1,251,000,000	-1,171,000,000	-1,960,000,000	-2,144,000,000	-1,939,000,000
EBIT before Royalties after Capex (E)	R	-2,248,687,500	-1,881,353,600	515,630,300	1,602,076,000	3,250,758,400	1,835,591,200	2,673,423,200	4,539,940,000	5,055,465,000
Comment: Royalties										

Table 8.26: Royalty formula for unrefined minerals applied to financial information of Amplats' Mogalakwena mine (*continued*).

X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	11%	26%	39%	24%	27%	33%	36%
Royalty rate = R%	%	0.50%	0.50%	1.8%	3.4%	4.8%	3.2%	3. 5%	4.2%	4.6%
Royalty paid by refiner (R = R% * G)	R	17,105,000	18,775,000	79,992,256	208,943,444	403,210,378	242,199,578	347,477,022	573,332,778	631,038,333
Operating Profit (Eo) less Royalties (R) = E*	R	1,877,207,500	1,063,871,400	1,681,638,044	2,743,132,556	4,098,548,022	2,764,391,622	4,285,946,178	6,110,607,222	6,363,426,667

Source: Anglo Platinum Limited (2008 and 2009); Anglo American Platinum Limited (2012, 2013, 2014 and 2015).

Table 8.27: Royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production Volume	oz	439,350	391,000	422,078	408,570	414,946	334,850	406,497	430,743	442,477
Price Received	\$/oz	1,386	1,887	1,044	1,227	1,454	1,322	1,243	1,180	1,099
Exchange rate	R/\$	7.2	7.2	9	7.6	7	7.8	8.8	10.4	11.4
Gross Sales revenue (G)	R	4,372,182,738	5,334,416,910	3,979,064,371	3,799,970,656	4,241,420,333	3,443,985,826	4,446,426,785	5,270,829,794	5,553,342,987
Operating Costs:										
Unit cost	R/oz	3,069	4,241	5,174	5,769	6,273	8,748	8,343	9,115	9,168
Total Opex	R	1,348,365,150	1,658,231,000	2,183,831,572	2,357,040,330	2,602,956,258	2,929,267,800	3,391,404,471	3,926,222,445	4,056,629,136
Operating profit before Royalty + Capex = Eo	R	3,023,817,588	3,676,185,910	1,795,232,799	1,442,930,326	1,638,464,075	514,718,026	1,055,022,314	1,344,607,349	1,496,713,851
Comment: Tax shield										
Capex	\$	35,000,000	48,000,000	31,000,000	26,000,000	50,000,000	64,000,000	45,499,000	38,946,000	35,959,000

Table 8.27: Royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine (*continued*).

Capex redemption	R	-250,000,000	-347,000,000	-281,000,000	-197,080,000	-349,000,000	-495,916,000	-400,440,000	-404,002,000	-410,524,000
EBIT before Royalties after Capex (E)	R	2,773,817,588	3,329,185,910	1,514,232,799	1,245,850,326	1,289,464,075	18,802,026	654,582,314	940,605,349	1,086,189,851
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	63%	62%	38%	33%	30%	1%	15%	18%	20%
Royalty rate = R%	%	7%	7%	4.7%	4.1%	3.9%	0.6%	2.1%	2.5%	2.7%
Royalty paid by miner (R = R% * G)	R	306,052,792	373,409,184	188,143,411	157,427,667	164,480,888	19,309,043	94,963,502	130,865,854	148,454,476
Operating Profit (Eo) less Royalties (R) = E*	R	2,717,764,796	3,302,776,726	1,607,089,388	1,285,502,659	1,473,983,187	495,408,983	960,058,812	1,213,741,494	1,348,259,375

Source: Aquarius Platinum Limited (2007, 2010, 2011 and 2015).

Model 4's Steel_Iron ore sub-sector assessment.

Table 8.28: Royalty formula for unrefined minerals applied to financial information of AMSA's Flat steel division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	4,231,000	4,084,000	3,428,000	3,814,000	4,060,000	3,554,000	3,229,000	3,586,000	3,145,000
Sales Volume	t	3,928,000	3,412,000	2,858,000	3,348,000	3,424,000	3,141,000	2,771,000	2,981,000	2,678,000
Assumed prices	$/t	659	906.9	683.4	809.4	891.9	828.2	782.1	738	597.5
Average exchange rate	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	10.8	12.8
Gross Sales revenue (G)	R	18,275,177,120	25,557,862,372	16,484,164,338	19,889,717,378	22,171,810,003	21,356,267,098	20,912,936,512	23,847,761,520	20,417,339,800
Operating Costs:										
Unit production cost	R/t	2,538	4,032	4,070	4,045	4,823	5,064	5,267	5,635	5,729
Total production cost	R	10,738,278,000	16,466,688,000	13,951,960,000	15,427,630,000	19,581,380,000	17,997,989,100	17,006,238,880	20,208,508,540	18,018,459,800
Operating profit before Royalty + Capex = Eo	R	7,536,899,120	9,091,174,372	2,532,204,338	4,462,087,378	2,590,430,003	3,358,277,998	3,906,697,632	3,639,252,980	2,398,880,000
Comment: Tax Shield										
Capex redemption	R	-1,443,000,000	-1,035,000,000	-630,000,000	-1,147,000,000	-717,000,000	-594,000,000	-835,000,000	-501,000,000	-601,000,000
EBIT before Royalties after Capex (E)	R	6,093,899,120	8,056,174,372	1,902,204,338	3,315,087,378	1,873,430,003	2,764,277,998	3,071,697,632	3,138,252,980	1,797,880,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	33%	32%	12%	17%	8%	13%	15%	13%	9%
Royalty rate = R%	%	4.2%	4%	1.8%	2.4%	1.4%	1.9%	2.1%	2%	1.5%

Table 8.28: Royalty formula for unrefined minerals applied to financial information of AMSA's Flat steel division (*continued*).

Royalty paid by refiner (R = R% * G)	R	768,475,788	1,022,919,798	293,776,859	467,791,629	319,017,939	413,923,335	445,864,420	467,933,583	301,851,143
Operating Profit (Eo) less Royalties (R) = E*	R	6,768,423,332	8,068,254,574	2,238,427,478	3,994,295,750	2,271,412,064	2,944,354,662	3,460,833,213	3,171,319,397	2,097,028,857

Source: ArcelorMittal South Africa Limited (2008, 2009, 2010); ArcelorMittal (2011, 2012, 2013, 2014 and 2015); ArcelorMittal South Africa Limited (2014).

Table 8.29: Royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	34,000,000	34,000,000	39,400,000	41,300,000	38,900,000	33,700,000	30,900,000	35,500,000	31,400,000
Export sales volume	t	24,000,000	24,900,000	34,200,000	36,100,000	37,183,000	31,200,000	27,000,000	27,870,000	27,200,000
Export sales price	$/t	54	88	65	124.8	157.3	122	135	97	56
Average exchange rate	R/$	7	8.3	8.4	7.3	7.3	8.2	9.6	10.8	12.8
Export Sales Revenue	R	9,110,880,000	18,077,400,000	18,650,970,000	32,888,544,000	42,390,943,938	31,174,416,000	35,064,900,000	29,277,713,700	19,436,032,000
Domestic sales volume	t	6,500,000	5,600,000	4,000,000	5,000,000	5,000,000	3,500,000	3,900,000	3,830,000	3,000,000
Domestic sales price	R/t	127	136	204	247	462.4	532.4	390.3	397.9	727
Domestic Sales Revenue	R	825,500,000	761,600,000	816,000,000	1,234,200,000	2,312,050,000	1,863,225,000	1,522,326,000	1,523,803,800	2,181,000,000
Gross Sales Revenue (Total)	R	9,936,380,000	18,839,000,000	19,466,970,000	34,122,744,000	44,702,993,938	33,037,641,000	36,587,226,000	30,801,517,500	21,617,032,000
Operating Costs:										
Unit production cost	R/t	74.3	101.9	98.8	113.7	150.5	197.8	267	271.8	310.8

Table 8.29: Royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine (*continued*).

Total Production costs	R	2,526,200,000	3,463,240,000	3,893,902,000	4,695,397,000	5,853,283,000	6,664,175,000	8,248,446,000	9,650,320,000	9,759,120,000
Operating profit before Royalty + Capex = Eo	R	7,410,180,000	15,375,760,000	15,573,068,000	29,427,347,000	38,849,710,938	26,373,466,000	28,338,780,000	21,151,197,500	11,857,912,000
Comment: Tax shield										
Capex	R	-439,000,000	-4,683,000,000	-1,382,000,000	-1,794,000,000	-3,126,000,000	-4,057,000,000	-5,054,000,000	-6,132,000,000	-5,715,000,000
EBIT before Royalties after Capex (E)	R	6,971,180,000	10,692,760,000	14,191,068,000	27,633,347,000	35,723,710,938	22,316,466,000	23,284,780,000	15,019,197,500	6,142,912,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	70%	57%	73%	81%	80%	68%	64%	49%	28%
Royalty rate = R%	%	7%	6.8%	7%	7%	7%	7%	7%	5.9%	3.7%
Royalty paid by miner (R = R% * G)	R	695,546,600	1,282,279,444	1,362,687,900	2,388,592,080	3,129,209,576	2,312,634,870	2,561,105,820	1,822,807,310	790,630,938
Operating Profit (Eo) less Royalties (R) = E*	R	6,714,633,400	14,093,480,556	14,210,380,100	27,038,754,920	35,720,501,362	24,060,831,130	25,777,674,180	19,328,390,190	11,067,281,062

Source: Kumba Iron ore (2007, 2008 and 2009); Anglo American Kumba Iron ore (2010, 2011); Anglo American Kumba Iron ore (2012, 2013, 2014 and 2015).

Model 4's coal sub-sector assessment.

Table 8.30: Royalty formula for unrefined minerals applied to financial information of Sasol's Synfuels (SA) segment.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	7,326,000	7,403,000	7,103,000	7,380,000	7,088,000	7,168,000	7,443,000	7,610,000	7,762,200
Sales volume	t	7,379,000	7,503,000	6,983,000	7,522,000	7,088,000	7,071,000	7,439,000	7,534,000	7,762,200
Gross Sales Revenue	R	28,686,242,726	39,173,630,530	37,330,652,964	33,494,898,083	37,111,823,767	48,346,982,704	57,729,264,646	67,078,876,077	55,149,066,316
Operating Costs:										
Cash costs per production ton	R/t	1,666	1,882	2,473	2,329	2,662	3,085	3,495	3,864	3,713
Total production Cash costs	R	12,205,116,000	13,932,446,000	17,565,719,000	17,188,020,000	18,868,256,000	22,113,280,000	26,013,285,000	29,405,040,000	28,816,934,634
Operating profit before Royalty + Capex = Eo	R	16,481,126,726	25,241,184,530	19,764,933,964	16,306,878,083	18,243,567,767	26,233,702,704	31,715,979,646	37,673,836,077	26,332,131,682
Comment: Tax shield										
Synfuel Capex redemption	R	-631,000,000	-720,000,000	-816,000,000	-1,445,000,000	-1,886,000,000	-2,467,000,000	-3,339,000,000	-4,181,000,000	-3,465,000,000
EBIT before Royalties after Capex (E)	R	15,850,126,726	24,521,184,530	18,948,933,964	14,861,878,083	16,357,567,767	23,766,702,704	28,376,979,646	33,492,836,077	22,867,131,682
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	55%	63%	51%	44%	44%	49%	49%	50%	41%

Table 8.30: Royalty formula for unrefined minerals applied to financial information of Sasol's Synfuels (SA) segment (*continued*).

Royalty rate = R%	%	6.6%	7%	6.1%	5.4%	5.4%	6%	6%	6.1%	5.1%
Royalty paid by refiner (R = R% * G)	R	1,904,556,405	2,742,154,137	2,292,090,372	1,818,794,277	2,003,066,648	2,882,479,658	3,441,644,062	4,056,820,611	2,816,537,741
Operating Profit (Eo) less Royalties (R) = E*	R	14,576,570,321	22,499,030,393	17,472,843,592	14,488,083,805	16,240,501,118	23,351,223,046	28,274,335,585	33,617,015,466	23,515,593,941

Source: Sasol Limited Group (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015a); Sasol Limited (2008, 2011, 2012, 2013, 2014 and 2016); Sasol (2014).

Table 8.31: Royalty formula for unrefined minerals applied to financial information of Anglo American's Thermal coal SA division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Revenue	R	10,842,900,000	18,276,700,000	14,692,270,000	15,442,518,611	19,180,920,000	20,336,170,000	21,104,550,000	22,600,550,000	24,192,540,000
Total Operating costs	R	7,451,850,000	11,544,920,000	10,066,770,000	11,497,038,611	12,632,400,000	15,352,700,000	16,482,200,000	17,577,000,000	19,783,440,000
Operating profit before Royalty + Capex = Eo	R	3,391,050,000	6,731,780,000	4,625,500,000	3,945,480,000	6,548,520,000	4,983,470,000	4,622,350,000	5,023,550,000	4,409,100,000
Comment: Tax Shield										
Capex redemption	R	- 853,050,000	- 832,557,440	- 504,734,560	- 450,831,480	- 777,437,100	- 1,285.472,540	- 2,065,100,000	- 1,009,050,000	- 1,329,120,000
EBIT before Royalties after Capex (E)	R	2,538,000,000	5,899,222,560	4,120,765,440	3,494,648,520	5,771,082,900	3,697,997,460	2,557,250,000	4,014,500,000	3,079,980,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	23%	32%	28%	23%	30%	18%	12%	18%	13%
Royalty rate = R%	%	3.1%	4.1%	3.6%	3%	3.8%	2.5%	1.8%	2.5%	1.9%

Table 8.31: Royalty formula for unrefined minerals applied to financial information of Anglo American's Thermal coal SA division (*continued*).

Royalty paid by miner (R = R% * G)	R	336,214,500	746,852,673	531,324,177	465,506,873	737,136,033	512,569,457	389,661,639	559,058,306	463,182,700
Operating Profit (Eo) less Royalties (R) = E*	R	3,054,835,500	5,984,927,327	4,094,175,823	3,479,973,127	5,811,383,967	4,470,900,543	4,232,688,361	4,464,491,694	3,945,917,300

Source: Anglo American (2008b, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

APPENDIX XII

Table 8.32: Group Statistics for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

Commodity sector	Type of producer	N	Mean of Royalties paid (R)	Std. Deviation	Std. Error Mean
Gold	Refiner (deep mine)	9	12,684,706	5,385,056	1,795,019
	Refiner (shallow mine)	9	97,489,179	21,470,441	7,156,814
PGMs	Refiner	9	280,230,421	227,167,005	75,722,335
	Miner-only	9	175,900,757	106,315,525	35,438,509
Steel_Iron ore	Refiner	9	500,172,722	243,021,358	81,007,120
	Miner-only	9	1,816,166,060	840,491,157	280,163,719
Synfuels_Coal	Refiner	9	2,662,015,990	749,001,858	249,667,286
	Miner-only	9	526,834,040	140,027,569	46,675,857

These results were further used in the Levene's Test for Equality of Variances and t-test for Equality of means calculations. The results are presented in Table 8.33.

Table 8.33: Independent Samples Test for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Gold	Equal variances assumed	15.409	.001	-11.493	16	.000	-84,804,473	7,378,487	-100,446,167	-69,162,779
	Equal variances not assumed			-11.493	9.003	.000	-84,804,473	7,378,487	-101,495,052	-68,113,895
PGMs	Equal variances assumed	6.087	.025	1.248	16	.230	104,329,664	83,604,784	-72,904,561	281,563,888
	Equal variances not assumed			1.248	11.344	.237	104,329,664	83,604,784	-79,004,616	287,663,943
Steel_Iron ore	Equal variances assumed	13.166	.002	-4.512	16	.000	-1,315,993,338	291,639,954	-1,934,242,422	-697,744,254
	Equal variances not assumed			-4.512	9.328	.001	-1,315,993,338	291,639,954	-1,972,205,620	-659,781,056
Synfuels_Coal	Equal variances assumed	11.274	.004	8.406	16	.000	2,135,181,951	253,992,892	1,596,741,073	2,673,622,828
	Equal variances not assumed			8.406	8.559	.000	2,135,181,951	253,992,892	1,556,060,421	2,714,303,480

The interpretation of independent samples t-test results for model 5 in terms of Econometric analysis phase 1's specifications are discussed as follows:

Econometric analysis phase 1 of Model 4's assessment.

<u>Gold sub-sector</u>:

Step 1:

p-value (Sig.) = 0.001 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by deep-level gold producer and royalties paid by shallow-level gold producer **are not** equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by deep-level gold producer and royalties paid by shallow-level gold producer.

Step 3:

Eta squared (η^2) = $\frac{(-11.493)^2}{(-11.493)^2+(9+9-2)}$ = 0.89

η^2 = 0.89 to 2 d.p.

Using Cohen's guidelines,

0.89> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the gold sector is as follows:

With the shallow mine (refiner) paying more royalties than the deep-level gold mine (also a refiner), the magnitude of this difference using their average royalty payments for the years of assessment is R84,804,473.

<u>PGM sub-sector</u>:

Step 1:

p-value (Sig.) = 0.025 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined PGM producer and royalties paid by PGM concentrates producer **are not** equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.237 > 0.05

Therefore, the null hypothesis fails to be rejected, meaning that there is no statistically significant difference between royalties paid by refined PGM producer and royalties paid by PGM concentrates producer.

Step 3:

No need to calculate Eta squared (η^2) value since there is no statistically significant difference between royalties paid by refined PGM producer and royalties paid by PGM concentrates producer.

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the PGM sector is as follows:

With more evidence from financial statement and realized beneficiation incentive assessment showing that refiner paid more royalties than the refiner in many of the years of assessment, the magnitude of this difference based on their average royalty payments is R104,329,664.

<u>Steel-Iron ore sub-sector</u>:

Step 1:

p-value (Sig.) = 0.002 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined iron (steel) producer and royalties paid by unrefined iron ore producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.001 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by refined iron (steel) producer and royalties paid by unrefined iron producer.

Step 3:

Eta squared (η^2) = $\frac{(-4.512)^2}{(-4.512)^2+(9+9-2)}$ = 0.5599335

η^2 = 0.56 to 2 d.p.

Using Cohen's guidelines,

0.56> 0.14 = very large effect

Step 4:

The difference between the mean Rand values of royalty payments of the two classes of producers in the iron ore sector is as follows:

With the miner-only paying more royalties than the refiner, the magnitude of this difference using their average royalty payments for the years of assessment is R1,315,993,338.

<u>Synfuels-Coal sub-sector</u>:

Step 1:

p-value (Sig.) = 0.004 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined Coal (synfuels) producer and royalties paid by unrefined Coal producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by refined Coal (synfuels) producer and royalties paid by unrefined Coal producer.

Step 3:

Eta squared (η^2) = $\frac{(8.406)^2}{(8.406)^2+(9+9-2)}$ = 0.815372194

η^2 = 0.82 to 2 d.p.

Using Cohen's guidelines,

0.82> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the coal sector is as follows:

With the refiner paying more royalties than the miner-only, the magnitude of this difference using their average royalty payments for the years of assessment is R R2,135,181,951.

Econometrics analysis phase 2 of Model 4's assessment.

Realized beneficiation incentive assessment for gold sub-sector

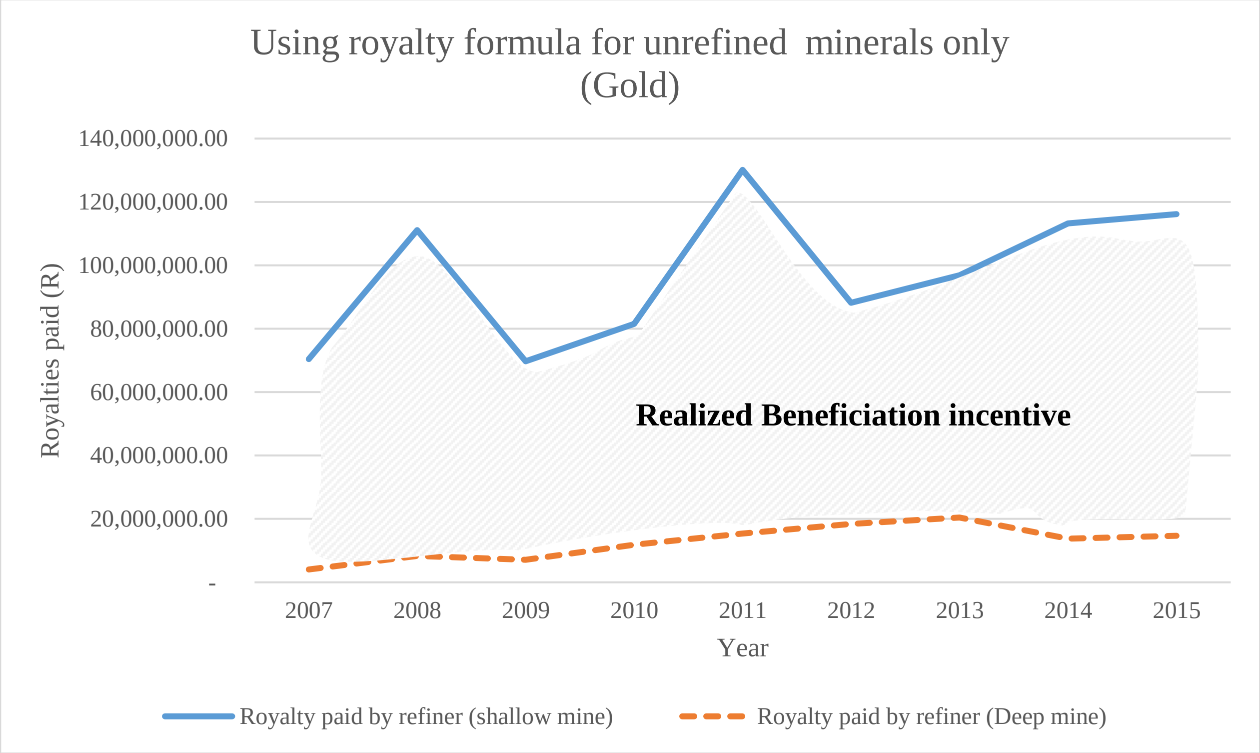

Figure 8.9: Royalty payments for both Gold producers.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.9, it can be observed that the shallow mine gold producer still paid a higher penalty in terms of royalty payments. However, the magnitude of these higher royalty payments was more than in other four models. Hence, there was no case of realized beneficiation incentive in existence here again, instead it was the mine that possessed greater revenues that paid greater royalty payments.

Realized beneficiation incentive assessment for PGM sub-sector

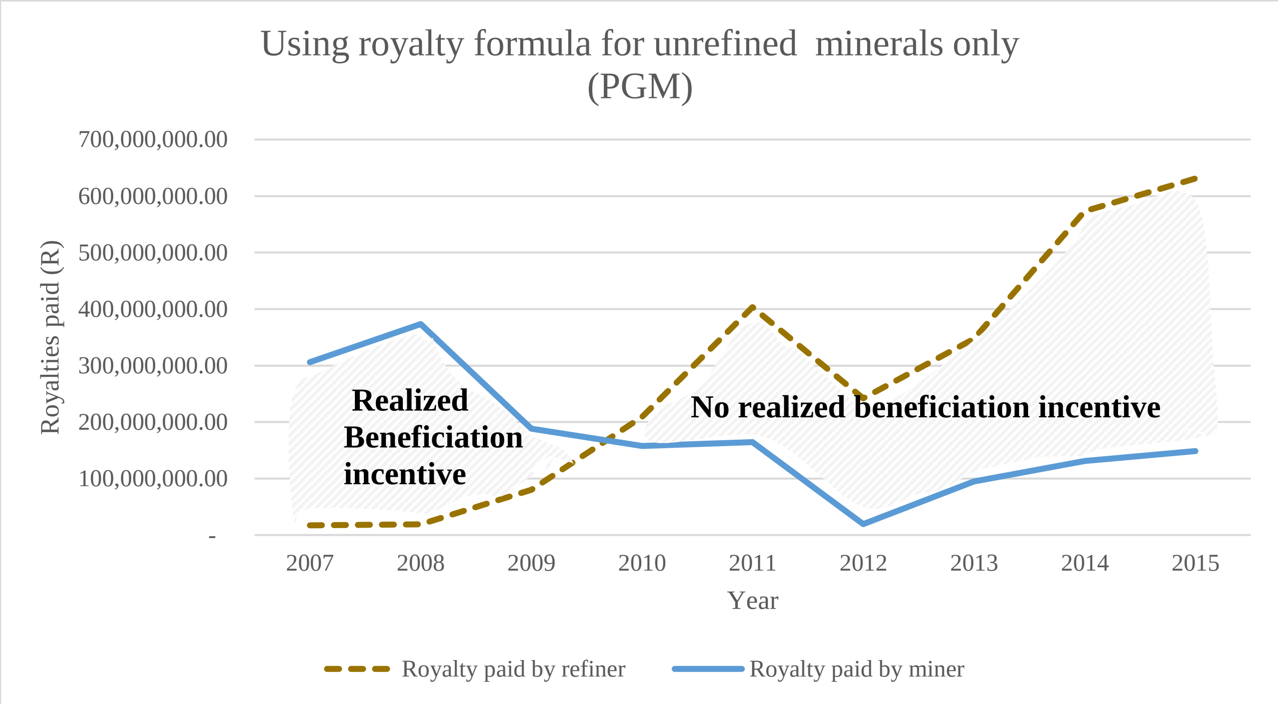

Figure 8.10: Royalty payments for both Refined and Unrefined PGM production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.10, it can be observed that in years 2007 to 2009, the unrefined mineral producer paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments in those 3 years. However, from 2010 onwards, the refined mineral producer paid the higher penalty in terms of royalty payments. This signified a disincentive to the refiner.

Realized beneficiation incentive assessment for steel-iron ore sub-sector

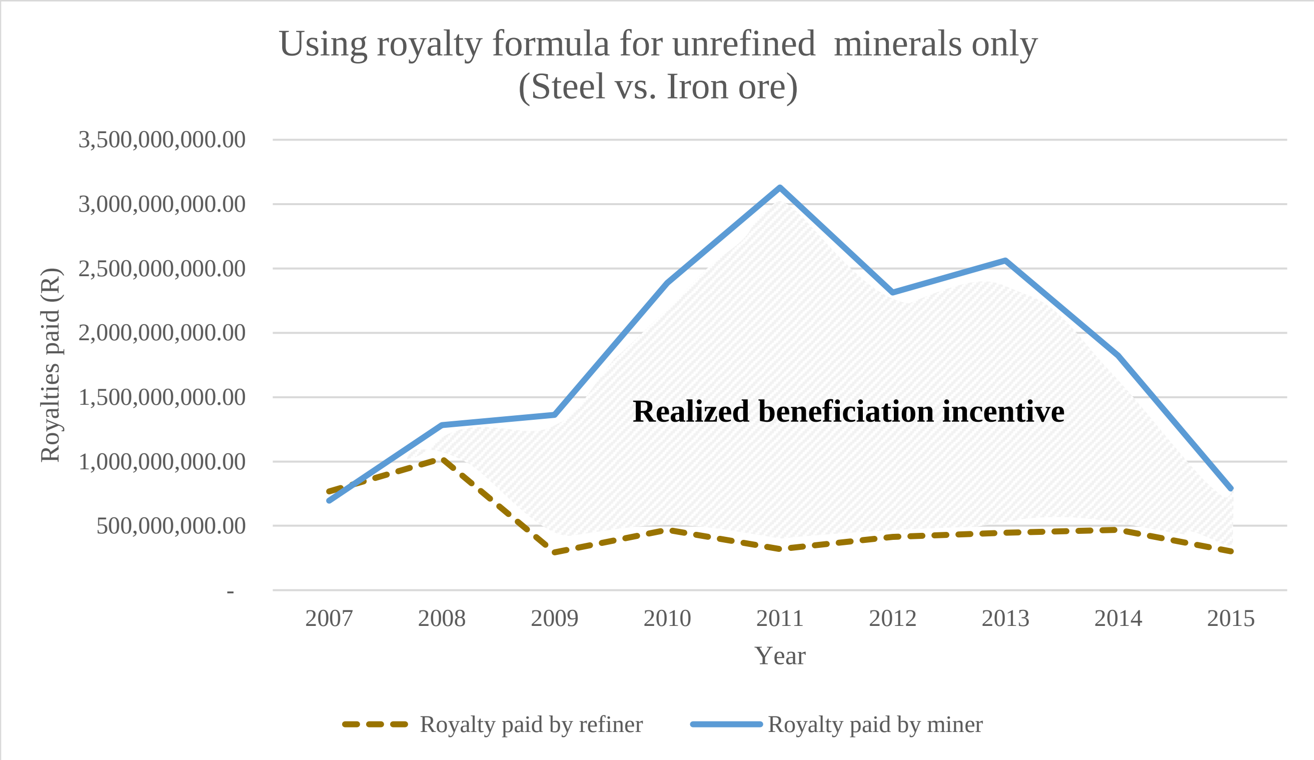

Figure 8.11: Royalty payments for both Refined and Unrefined iron production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.11, it can be observed that the refined production paid higher royalties in 2007, more than its value in model 3. However, from 2008 onwards, unrefined production paid a higher penalty in terms of royalty payments. The magnitude of this royalty penalty through higher royalty payments was more than in model 3. Hence, it appeared that some realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Realized beneficiation incentive assessment for coal sub-sector

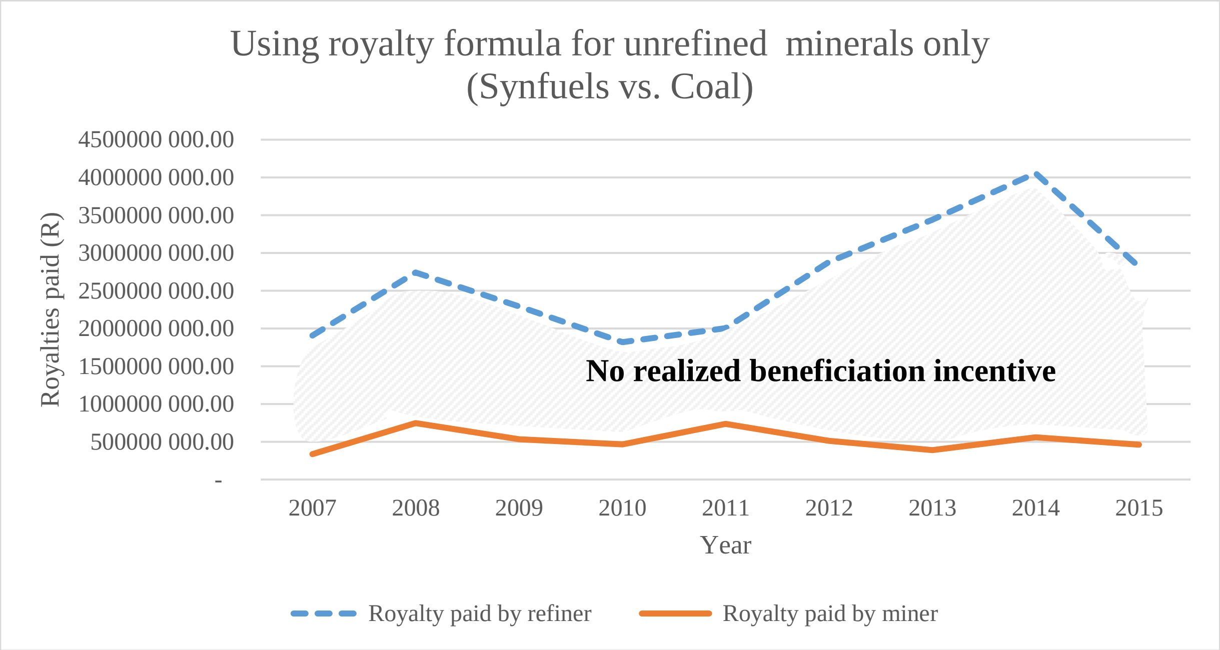

Figure 8.12: Royalty payments for both Refined and Unrefined coal production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.12, it can be observed that the refined production paid a higher penalty in terms of royalty payments, although the magnitude was more than that of models 1 to 3. Hence, no realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Table 8.34 provides a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases that were conducted.

Table 8.34: Statement of interpretation of results using royalty formula for unrefined minerals only.

Commodity sectors	Results and Observations	Interpretation	Deductions
Gold: South Deep mine (refiner) vs. Beatrix Mine (refiner)	Step 1: p-value (Sig.) = 0.001 < 0.05	Variances are not equal.	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of processing; 2. Royalty rate incentive was not applicable here, as it was the producer with the greater revenue (depending on the peculiar economic situation of the producer) that paid greater royalties; 3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference.	
	Step 3: $\eta^2 = 0.89$ to 2 d.p. Using Cohen's guidelines, 0.89 > 0.14 = very large effect	The magnitude of difference is very large.	
	Step 4:	The difference between the means of royalties paid is R84,804,473.	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner (deep mine) **paid lesser** royalties than refiner (shallow mine). Shallow mine's royalties were more than when formula for refined minerals was applied.	
PGMs: Mogalakwena mine (refiner)	Step 1: p-value (Sig.) = 0.025 < 0.05	Variances are not equal	1. Realized beneficiation incentive based on profitability performance for refiner occurred in only 3 years, but wiped out for the next 6 years;
	Step 2:	There is no statistically significant difference.	

Table 8.34: Statement of interpretation of results using royalty formula for unrefined minerals only (*continued*).

vs. Kroondal mine (miner-only)	p-value (Sig. (2-tailed) = 0.237 > 0.05		2. Realized beneficiation incentive had mixed results but leaned more towards no savings (it was better to be a miner-only as refiner was ‘penalized’); 3. The mixed result appeared to support the gold sector case, due to the indication that the level of processing was not the differentiating factor for royalties paid by the different producers. Instead, it was the producer with the greater revenue that paid greater royalties; 4. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 3: η^2 not calculated	The magnitude of difference not calculated because there was no statistically significant difference.	
	Step 4:	The difference between the means of royalties paid is R104,329,664.	
	Realized beneficiation incentive assessment:	Refiner paid lesser royalties than miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more royalties than the Miner-only (but magnitude of refiner’s payment is more than when royalty formula for refined minerals was applied).	
Steel_Iron ore: ArcelorMittal Flat steel (refiner) vs. Kumba Iron ore (Miner-only)	Step 1: p-value (Sig.) = 0.002 < 0.05	Variances are not equal.	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of processing; 2. Royalty rate incentive was not applicable here, as it was the producer with the greater revenue that paid greater royalties;
	Step 2: p-value (Sig. (2-tailed) = 0.001 < 0.05	There is a statistically significant difference.	
	Step 3: η^2 = 0.56 to 2 d.p.	The magnitude of difference is very large.	

Table 8.34: Statement of interpretation of results using royalty formula for unrefined minerals only (*continued*).

	Using Cohen's guidelines, 0.56> 0.14 = very large effect		3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 4:	The difference between the means of royalties paid is R1,315,993,338.	
	Realized beneficiation incentive assessment:	1. In 2009, the refiner paid **more** royalties than the miner-only; 2. For all other years of assessment, refiner **paid lesser** royalties than miner-only.	
Synfuels_Coal: Sasol Synfuels SA (refiner) vs. Anglo Coal SA (miner-only)	Step 1: p-value (Sig.) = 0.004 < 0.05	Variances are not equal.	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of processing; 2. Royalty rate incentive was not applicable here, as it was the producer with the greater revenue that paid greater royalties; 3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference.	
	Step 3: $\eta 2$ = 0.82 to 2 d.p. Using Cohen's guidelines, 0.82 > 0.14 = very large effect	The magnitude of difference is very large.	
	Step 4:	The difference between the means of royalties paid is R2,135,181,951.	

Table 8.34: Statement of interpretation of results using royalty formula for unrefined minerals only (*continued*).

	Realized beneficiation incentive assessment:	For all the years of assessment, refiner paid **more** royalties than miner-only. Refiner's royalty payments were more than when royalty formula for refined minerals was applied	

APPENDIX XIII

Model 5’s Gold sub-sector assessment.

Table 8.35: Tweaked royalty formula for unrefined minerals applied to financial information of Gold Fields’ South Deep mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	1,104,000	1,367,000	1,241,000	1,681,000	2,440,000	2,106,000	2,347,000	1,323,000	1,496,000
Gold produced	kg	5,076	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold sold	kg	5,166	7,220	5,434	8,236	8,491	8,411	9,397	6,237	6,160
Gold price received	R/kg	156,899	231,187	259,921	288,022	363,538	438,961	434,915	442,023	478,166
Gross Sales Revenue	R	810,540,234	1,669,170,140	1,412,410,714	2,372,149,192	3,086,800,309	3,692,100,130	4,086,900,014	2,756,900,008	2,945,499,973
Total Operating costs	R	720,000,000	1,263,526,000	1,188,419,000	1,674,422,000	2,138,400,000	2,480,751,000	3,089,280,000	2,656,310,000	3,000,088,000
Operating profit before Royalty+Capex = Eo	R	90,540,234	405,644,140	223,991,714	697,727,192	948,400,309	1,211,349,130	997,620,014	100,590,008	-54,588,027
Comment: Tax Shield										
Capex redemption	R	-283,400,000	-784,700,000	-1,020,500,000	-1,613,300,000	-1 982 400 000,00	-2,575,800,000	-1,943,300,000	-994,360,000	-848,300,000
EBIT before Royalties after Capex (E)	R	-192,859,766	-379,055,860	-796,508,286	-915,572,808	-1,033,999,691	-1,364,450,870	-945,679,986	-893,769,992	-902,888,027
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Royalty rate = R%	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

Table 8.35: Tweaked royalty formula for unrefined minerals applied to financial information of Gold Fields' South Deep mine (*continued*).

Royalty paid by refiner (Deep mine)	R	4,052,701	8,345,851	7,062,054	11,860,746	15,434,002	18,460,501	20,434,500	13,784,500	14,727,500
Operating Profit (Eo) less Royalties (R) = E*	R	86,487,533	397,298,289	216,929,660	685,866,446	932,966,307	1,192,888,629	977,185,513	86,805,508	-69,315,527

Source: Gold Fields Limited (2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

Table 8.36: Tweaked royalty formula for unrefined minerals applied to financial information of Sibanye Gold's Beatrix mine.

	Year / units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes Milled	t	3,590,000	3,215,000	2,991,000	3,051,000	3,817,000	3,368,000	4,091,000	4,546,000	4,319,000
Gold produced and sold	kg	16,903	13,625	12,164	12,188	10,787	8,981	9,722	10,354	10,105
Gold price received	R/kg	157,249	231,750	259,126	287,187	371,772	435,698	433,460	441,018	476,546
Gross Sales Revenue (G)	R	2,657,979,847	3,157,593,750	3,152,008,664	3,500,235,156	4,010,304,564	3,913,003,738	4,214,098,120	4,566,300,372	4,815,497,330
Operating Costs:										
Unit Opex	R/t	432	536	681	745	631	783	732	705	785
Total Opex	R	1,550,880,000	1,723,240,000	2,036,871,000	2,272,995,000	2,408,527,000	2,637,144,000	2,994,612,000	3,204,930,000	3,390,415,000
Operating profit before Royalty+Capex = Eo	R	1,107,099,847	1,434,353,750	1,115,137,664	1,227,240,156	1,601,777,564	1,275,859,738	1,219,486,120	1,361,370,372	1,425,082,330
Comment: Tax Shield										
Capex redemption	R	- 592,800,000	- 576,600,000	- 629,400,000	- 650,600,000	- 611,100,000	- 658,200,000	- 537,000,000	- 548,000,000	- 596,500,000

Table 8.36: Tweaked royalty formula for unrefined minerals applied to financial information of Sibanye Gold’s Beatrix mine (*continued*).

EBIT before Royalties after Capex (E)	R	514,299,847	857,753,750	485,737,664	576,640,156	990,677,564	617,659,738	682,486,120	813,370,372	828,582,330
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	19%	27%	15%	16%	25%	16%	16%	18%	17%
Royalty rate = R%	%	5.3%	7%	4.4%	4.6%	6.7%	4.5%	4.6%	5%	4.8%
Royalty paid by refiner (Shallow mine)	R	141,864,861	221,031,563	137,194,459	161,661,215	267,720,914	173,979,953	191,692,021	226,174,095	231,223,069
Operating Profit (Eo) less Royalties (R) = E*	R	965,234,986	1,213,322,188	977,943,205	1,065,578,941	1,334,056,650	1,101,879,785	1,027,794,099	1,135,196,277	1,193,859,261

Source: Gold Fields Limited (2008, 2009, 2010 and 2011); SibanyeGold (2012, 2013a, 2014a and 2015a); SibanyeGold (2013b, 2014b and 2015b).

Model 5's PGM sub-sector assessment.

Table 8.37: Tweaked royalty formula for unrefined minerals applied to financial information of Amplats' Mogalakwena mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tonnes milled	t	4,187,000	7,180,000	9,722,000	10,380,000	10,835,000	10,480,000	11,031,000	11,731,000	11,725,000
Pt produced	oz	162,500	177,400	233,300	272,300	312,800	304,800	342,800	375,400	392,500
Gross Sales Revenue	R	3,421,000,000	3,755,000,000	4,540,000,000	6,187,000,000	8,403,000,000	7,649,000,000	10,086,000,000	13,779,000,000	13,864,000,000
Operating Costs:										
Unit on-mine cost/tonnes milled	R/t	282	288	196	231	254	315	360	437	409
On-mine costs (mining and concentration)	R	1,180,734,000	2,067,840,000	1,905,512,000	2,397,780,000	2,752,090,000	3,301,200,000	3,971,160,000	5,126,447,000	4,795,525,000
Processing (smelting, treatment and refining) costs	R	345,953,500	604,513,600	872,857,700	837,144,000	1,149,151,600	1,341,208,800	1,481,416,800	1,968,613,000	2,074,010,000
Total operating costs	R	1,526,687,500	2,672,353,600	2,778,369,700	3,234,924,000	3,901,241,600	4,642,408,800	5,452,576,800	7,095,060,000	6,869,535,000
Operating profit before Royalty+Capex = Eo	R	1,894,312,500	1,082,646,400	1,761,630,300	2,952,076,000	4,501,758,400	3,006,591,200	4,633,423,200	6,683,940,000	6,994,465,000
Comment: Tax shield										
Capex redemption	R	-4,143,000,000	-2,964,000,000	-1,246,000,000	-1,350,000,000	-1,251,000,000	-1,171,000,000	-1,960,000,000	-2,144,000,000	-1,939,000,000
EBIT before Royalties after Capex (E)	R	-2,248,687,500	-1,881,353,600	515,630,300	1,602,076,000	3,250,758,400	1,835,591,200	2,673,423,200	4,539,940,000	5,055,465,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	0%	0%	11%	26%	39%	24%	27%	33%	36%

Table 8.37: Tweaked royalty formula for unrefined minerals applied to financial information of Amplats' Mogalakwena mine (*continued*).

Royalty rate = R%	%	0.5%	0.5%	3.3%	7%	7%	6.5%	7%	7%	7%
Royalty paid by Refiner (R = R% * G)	R	17,105,000	18,775,000	151,607,575	431,454,000	588,210,000	497,142,800	706,020,000	964,530,000	970,480,000
Operating Profit (Eo) less Royalties (R) = E*	R	1,877,207,500	1,063,871,400	1,610,022,725	2,520,622,000	3,913,548,400	2,509,448,400	3,927,403,200	5,719,410,000	6,023,985,000

Source: Anglo Platinum Limited (2008 and 2009); Anglo American Platinum Limited (2012, 2013, 2014 and 2015).

Table 8.38: Tweaked royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production Volume	oz	439,350	391,000	422,078	408,570	414,946	334,850	406,497	430,743	442,477
Price Received	$/oz	1,386	1,887	1,044	1,227	1,454	1,322	1,243	1,180	1,099
Exchange rate	R/$	7.2	7.2	9	7.6	7	7.8	8.8	10.4	11.4
Gross Sales revenue (G)	R	4,372,182,738	5,334,416,910	3,979,064,371	3,799,970,656	4,241,420,332	3,443,985,826	4,446,426,785	5,270,829,794	5.553,342,987
Operating Costs:										
Unit cost	R/oz	3,069	4,241	5,174	5,769	6,273	8,748	8,343	9,115	9,168
Total cost (calculated)	R	1,348,365,150	1,658,231,000	2,183,831,572	2,357,040,330	2,602,956,258	2,929,267,800	3,391,404,471	3,926,222,445	4,056,629,136
Total Opex	R	1,348,365,150	1,658,231,000	2,183,831,572	2,357,040,330	2,602,956,258	2,929,267,800	3,391,404,471	3,926,222,445	4,056,629,136
Operating profit before Royalty+Capex = Eo	R	3,023,817,588	3,676,185,910	1,795,232,799	1,442,930,326	1,638,464,075	514,718,026	1,055,022,314	1,344,607,345	1,496,713,851
Comment: Tax shield										
Capex	$	35,000,000	48,000,000	31,000,000	26,000,000	50,000,000	64,000,000	45,499,000	38,946,000	35,959,000

Table 8.38: Tweaked royalty formula for unrefined minerals applied to financial information of Aquarius' Kroondal mine (*continued*).

Capex redemption	R	- 250,000,000	- 347,000,000	- 281,000,000	- 197,080,000	- 349,000,000	- 495,916,000	- 400,440,000	- 404,002,000	- 410,524,000
EBIT before Royalties after Capex (E)	R	2,773,817,588	3,329,185,910	1,514,232,799	1,245,850,326	1,289,464,075	18,802,026	654,582,314	940,605,345	1,086,189,851
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	63%	62%	38%	33%	30%	1%	15%	18%	20%
Royalty rate = R%	%	7%	7%	7%	7%	7%	0.6%	4.2%	5%	5.4%
Unrefined Royalty paid (R = R% * G)	R	306,052,792	373,409,184	278,534,506	265,997,946	296,899,423	21,920,436	185,877,713	261,505,486	299,314,178
Operating Profit (Eo) less Royalties (R) = E*	R	2,717,764,796	3,302,776,726	1,516,698,293	1,176,932,380	1,341,564,651	492,797,590	869,144,601	1,083,101,863	1,197,399,673

Source: Aquarius Platinum Limited (2007, 2010, 2011 and 2015).

Model 5's Steel_Iron ore sub-sector assessment.

Table 8.39: Tweaked royalty formula for unrefined minerals applied to financial information of AMSA's Flat steel division.

	Year Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	4,231,000	4,084,000	3,428,000	3,814,000	4,060,000	3,554,000	3,229,000	3,586,000	3,145,000
Sales Volume	t	3,928,000	3,412,000	2,858,000	3,348,000	3,424,000	3,141,000	2,771,000	2,981,000	2,678,000
Assumed prices	$/t	659	907	683.4	809.4	891.9	828.2	782	738	597.5
Average exchange rate	R/$	7.1	8.3	8.4	7.3	7.3	8.2	9.7	10.8	12.8
Gross Sales revenue (G)	R	18,275,177,120	25,557,862,372	16,484,164,338	19,889,717,378	22,171,810,003	21,356,267,098	20,912,936,512	23,847,761,520	20,417,339,800
Operating Costs:										
Unit production cost	R/t	2,538	4,032	4,070	4,045	4,823	5,064	5,267	5,635	5729
Total production cost	R	10,738,278,000	16,466,688,000	13,951,960,000	15,427,630,000	19,581,380,000	17,997,989,100	17,006,238,880	20,208,508,540	18,018,459,800
Operating profit before Royalty+Capex = Eo	R	7,536,899,120	9,091,174,372	2,532,204,338	4,462,087,378	2,590,430,003	3,358,277,998	3,906,697,632	3,639,252,980	2,398,880,000
Comment: Tax Shield										
Capex	R	- 1,443,000,000	- 1,035,000,000	- 630,000,000	- 1,147,000,000	- 717,000,000	- 594,000,000	- 835,000,000	- 501,000,000	- 601,000,000
EBIT before Royalties after Capex (E)	R	6,093,899,120	8,056,174,372	1,902,204,338	3,315,087,378	1,873,430,003	2,764,277,998	3,071,697,632	3,138,252,980	1,797,880,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	33%	32%	12%	17%	8%	13%	15%	13%	9%
Royalty rate = R%	%	7%	7%	3.4%	4.7%	2.6%	3.7%	4.2%	3.8%	2.7%
Royalty paid by Refiner (R = R% * G)	R	1,279,262,398	1,789,050,366	557,971,906	928,220,432	579,216,551	797,850,835	872,489,091	903,802,053	551,556,699

Table 8.39: Tweaked royalty formula for unrefined minerals applied to financial information of AMSA's Flat steel division (*continued*).

Operating Profit (Eo) less Royalties (R) = E*	R	6,257,636,722	7,302,124,006	1,974,232,432	3,533,866,947	2,011,213,452	2,560,427,163	3,034,208,541	2,735,450,927	1,847,323,301

Source: ArcelorMittal South Africa Limited (2008, 2009, 2010); ArcelorMittal (2011, 2012, 2013, 2014 and 2015); ArcelorMittal South Africa Limited (2014).

Table 8.40: Tweaked royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	34,000,000	34,000,000	39,400,000	41,300,000	38,900,000	33,700,000	30,900,000	35,500,000	31,400,000
Export sales volume	t	24,000,000	24,900,000	34,200,000	36,100,000	37,183,000	31,200,000	27,000,000	27,870,000	27,200,000
Export sales price	$/t	54	88	65	124.8	157	122	135	97	56
Average exchange rate	R/$	7	8.3	8.4	7.3	7.3	8.2	9.6	10.8	12.8
Export Sales Revenue	R	9,110,880,000	18,077,400,000	18,650,970,000	32,888,544,000	42,390,943,938	31,174,416,000	35,064,900,000	29,277,713,700	19,436,032,000
Domestic sales volume	t	6,500,000	5,600,000	4,000,000	5,000,000	5,000,000	3,500,000	3,900,000	3,830,000	3,000,000
Domestic sales price	R/t	127	136	204	246.8	462.4	532.4	390.3	398	727
Domestic Sales Revenue	R	825,500,000	761,600,000	816,000,000	1,234,200,000	2,312,050,000	1,863,225,000	1,522,326,000	1,523,803,800	2,181,000,000
Gross Sales Revenue (Total)	R	9,936,380,000	18,839,000,000	19,466,970,000	34,122,744,000	44,702,993,938	33,037,641,000	36,587,226,000	30,801,517,500	21,617,032,000
Operating Costs:										
Unit production cost	R/t	74.3	101.9	98.8	113.7	150.5	197.8	267	271.8	310.8
Total Production costs	R	2,526,200,000	3,463,240,000	3,893,902,000	4,695,397,000	5,853,283,000	6,664,175,000	8,248,446,000	9,650,320,000	9,759,120,000
Operating profit before Royalty+Capex = Eo	R	7,410,180,000	15,375,760,000	15,573,068,000	29,427,347,000	38,849,710,938	26,373,466,000	28,338,780,000	21,151,197,500	11,857,912,000

Table 8.40: Tweaked royalty formula for unrefined minerals applied to financial information of Kumba Iron ore's Sishen mine (*continued*).

Comment: Tax shield										
Capex	R	- 439,000,000	- 4,683,000,000	- 1,382,000,000	- 1,794,000,000	- 3,126,000,000	- 4,057,000,000	- 5,054,000,000	- 6,132,000,000	- 5,715,000,000
EBIT before Royalties after Capex (E)	R	6,971,180,000	10,692,760,000	14,191,068,000	27,633,347,000	35,723,710,938	22,316,466,000	23,284,780,000	15,019,197,500	6,142,912,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	70%	57%	73%	81%	80%	68%	64%	49%	28%
Royalty rate = R%	%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Royalty paid by miner (R = R% * G)	R	695,546,600	1,318,730,000	1,362,687,900	2,388,592,080	3,129,209,576	2,312,634,870	2,561,105,820	2,156,106,225	1,513,192,240
Operating Profit (Eo) less Royalties (R) = E*	R	6,714,633,400	14,057,030,000	14,210,380,100	27,038,754,920	35,720,501,362	24,060,831,130	25,777,674,180	18,995,091,275	10,344,719,760

Source: Kumba Iron ore (2007, 2008 and 2009); Anglo American Kumba Iron ore (2010, 2011); Anglo American Kumba Iron ore (2012, 2013, 2014 and 2015).

Model 5's coal sub-sector assessment.

Table 8.41: Tweaked royalty formula for unrefined minerals applied to financial information of Sasol's Synfuels (SA) segment.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Production volume	t	7,326,000	7,403,000	7,103,000	7,380,000	7,088,000	7,168,000	7,443,000	7,610,000	7,762,200
Sales volume	t	7,379,000	7,503,000	6,983,000	7,522,000	7,088,000	7,071,000	7,439,000	7,534,000	7,762,200
Gross Sales Revenue	R	28,686,242,726	39,173,630,530	37,330,652,964	33,494,898,083	37,111,823,767	48,346,982,704	57,729,264,646	67,078,876,077	55,149,066,316
Operating Costs:										
Cash costs per production ton	R/t	1,666	1,882	2,473	2,329	2,662	3,085	3,495	3,864	3,713
Total production Cash costs	R	12,205,116,000	13,932,446,000	17,565,719,000	17,188,020,000	18,868,256,000	22,113,280,000	26,013,285,000	29,405,040,000	28,816,934,634
Operating profit before Royalty+Capex = Eo	R	16,481,126,726	25,241,184,530	19,764,933,964	16,306,878,083	18,243,567,767	26,233,702,704	31,715,979,646	37,673,836,077	26,332,131,682
Comment: Tax shield										
Synfuel Capex	R	- 631,000,000	- 720,000,000	- 816,000,000	- 1,445,000,000	- 1,886,000,000	- 2,467,000,000	- 3,339,000,000	- 4,181,000,000	- 3,465,000,000
EBIT before Royalties after Capex (E)	R	15,850,126,726	24,521,184,530	18,948,933,964	14,861,878,083	16,357,567,767	23,766,702,704	28,376,979,646	33,492,836,077	22,867,131,682
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	55%	63%	51%	44%	44%	49%	49%	50%	41%
Royalty rate = R%	%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Royalty paid by Refiner (R = R% * G)	R	2,008,036,991	2,742,154,137	2,613,145,708	2,344,642,866	2,597,827,664	3,384,288,789	4,041,048,525	4,695,521,325	3,860,434,642

Table 8.41: Tweaked royalty formula for unrefined minerals applied to financial information of Sasol's Synfuels (SA) segment *(continued)*.

Operating Profit (Eo) less Royalties (R) = E*	R	14,473,089,735	22,499,030,393	17,151,788,257	13,962,235,217	15,645,740,103	22,849,413,915	27,674,931,121	32,978,314,752	22,471,697,040

Source: Sasol Limited Group (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015a); Sasol Limited (2008, 2011, 2012, 2013, 2014 and 2016); Sasol (2014).

Table 8.42: Tweaked royalty formula for unrefined minerals applied to financial information of Anglo American's Thermal coal SA division.

	Year / Units	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Revenue	R	10,842,900,000	18,276,700,000	14,692,270,000	15,408,600,000	19,180,920,000	20,336,170,000	21,104,550,000	22,600,550,000	24,192,540,000
Total Operating costs	R	7,451,850,000	11,544,920,000	10,066,770,000	11,497,038,611	12,632,400,000	15,352,700,000	16,482,200,000	17,577,000,000	19,783,440,000
Operating profit before Royalty+Capex = Eo	R	3,391,050,000	6,731,780,000	4,625,500,000	3,945,480,000	6,548,520,000	4,983,470,000	4,622,350,000	5,023,550,000	4,409,100,000
Comment: Tax Shield										
Capex redemption	R	- 853,050,000	- 832,557,440	- 504,734,560	- 450,831,480	- 777,437,100	- 1,285,472,540	- 2,065,100,000	- 1,009,050,000	- 1,329,120,000
EBIT before Royalties after Capex (E)	R	2,538,000,000	5,899,222,560	4,120,765,440	3,494,648,520	5,771,082,900	3,697,997,460	2,557,250,000	4,014,500,000	3,079,980,000
Comment: Royalties										
X=EBIT (E)/Gross Sales Revenue (G)	%	23%	32%	28%	23%	30%	18%	12%	18%	13%
Royalty rate = R%	%	6.4%	7%	7%	6.2%	7%	5%	3.5%	5%	3.7%
Royalty paid by miner (R = R% * G)	R	688,714,500	1,279,369,000	1,028,458,900	950,874,723	1,342,664,400	1,026,180,215	744,835,250	1,116,627,750	890,957,700
Operating Profit (Eo) less Royalties (R) = E*	R	2,702,335,500	5,452,411,000	3,597,041,100	2,994,605,277	5,205,855,600	3,957,289,785	3,877,514,750	3,906,922,250	3,518,142,300

Source: Anglo American (2008b, 2009, 2010, 2011, 2012, 2013, 2014 and 2015).

APPENDIX XIV

Table 8.43: Group Statistics for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

Commodity sector	Type of producer	N	Mean of Royalties paid (R)	Std. Deviation	Std. Error Mean
Gold	Refiner (deep mine)	9	12,684,706	5,385,056	1,795,019
	Refiner (shallow mine)	9	194,728,017	44,692,072	14,897,357
PGMs	Refiner	9	482,813,819	366,666,673	122,222,224
	Miner-only	9	254,390,185	100,102,577	33,367,526
Steel_Iron ore	Refiner	9	917,713,370	400,737,878	133,579,293
	Miner-only	9	1,937,533,923	761,316,740	253,772,247
Synfuels_Coal	Refiner	9	3,143,011,183	898,185,488	299,395,163
	Miner-only	9	1,007,631,382	219,758,493	73,252,831

These results were further used in the Levene's Test for Equality of Variances and t-test for Equality of means calculations. The results are presented in Table 8.44.

Table 8.44: Independent Samples Test for royalty payments of refined and unrefined minerals producers in the four commodity sectors.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Gold	Equal variances assumed	21.52	0.000	-12.132	16	0.000	-182,043,311	15,005,111	-213,852,724	-150,233,897
	Equal variances not assumed			-12.132	8.232	0.000	-182,043,311	15,005,111	-216,475,975	-147,610,646
PGMs	Equal variances assumed	10.39	0.005	1.803	16	0.090	228,423,635	126,695,161	-40,158,109	497,005,379
	Equal variances not assumed			1.803	9.186	0.104	228,423,635	126,695,161	-57,298,840	514,146,109
Steel_Iron ore	Equal variances assumed	5.81	.028	-3.556	16	0.003	-1,019,820,553	286,781,765	-1,627,770,736	-411,870,371
	Equal variances not assumed			-3.556	12.117	0.004	-1,019,820,553	286,781,765	-1,643,995,461	-395,645,646
Synfuels_Coal	Equal variances assumed	17.63	.001	6.928	16	0.000	2,135,379,801	308,226,282	1,481,969,273	2,788,790,328
	Equal variances not assumed			6.928	8.954	0.000	2,135,379,801	308,226,282	1,437,581,750	2,833,177,852

The interpretation of independent samples t-test results for model 6 in terms of Econometric analysis phase 1's specifications are discussed as follows:

Econometric analysis phase 1 of Model 5's assessment.

<u>Gold sub-sector</u>:

Step 1:

p-value (Sig.) = 0.000 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by deep-level gold producer and royalties paid by shallow-level gold producer **are not** equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by deep-level gold producer and royalties paid by shallow-level gold producer.

Step 3:

Eta squared (η^2) = $\frac{(-12.132)^2}{(-12.132)^2+(9+9-2)}$ = 0.901

η^2 = 0.90 to 2 d.p.

Using Cohen's guidelines,

0.90> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the gold sector is as follows:

With the shallow mine (refiner) paying more royalties than the deep-level gold mine (also a refiner), the magnitude of this difference using their average royalty payments for the years of assessment is R182,043,311.

<u>PGM sub-sector</u>:

Step 1:

p-value (Sig.) = 0.005 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for the royalties paid by refined PGM producer and royalties paid by PGM concentrates producer **are not** equal.

Step 2:

Using p-value (Sig. (2-tailed) from ‘Equal variances not assumed’ row = 0.104 > 0.05

Therefore, the null hypothesis fails to be rejected, meaning that there is no statistically significant difference between royalties paid by refined PGM producer and royalties paid by PGM concentrates producer.

Step 3:

No need to calculate Eta squared (η^2) value since there is no statistically significant difference between royalties paid by refined PGM producer and royalties paid by PGM concentrates producer.

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the PGM sector is as follows:

With more evidence from financial statement and realized beneficiation incentive assessment showing that refiner paid more royalties than the refiner in many of the years of assessment, the magnitude of this difference based on their average royalty payments is R228,423,635.

Steel-iron ore sub-sector:

Step 1:

p-value (Sig.) = 0.028 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined iron (steel) producer and royalties paid by unrefined iron ore producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.004 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by refined iron (steel) producer and royalties paid by unrefined iron producer.

Step 3:

Eta squared (η^2) = $\frac{(-3.556)^2}{(-3.556)^2+(9+9-2)}$ = 0.441440

η^2 = 0.44 to 2 d.p.

Using Cohen's guidelines,

0.44> 0.14 = very large effect

Step 4:

The difference between the mean Rand values of royalty payments of the two classes of producers in the iron ore sector is as follows:

With the miner-only paying more royalties than the refiner, the magnitude of this difference using their average royalty payments for the years of assessment is R1,019,820,553.

Synfuels-Coal sub-sector:

Step 1:

p-value (Sig.) = 0.001 is lesser than 0.05

Therefore, the null hypothesis is rejected, meaning that variances for royalties paid by refined Coal (synfuels) producer and royalties paid by unrefined Coal producer are not equal.

Step 2:

Using p-value (Sig. (2-tailed) from 'Equal variances not assumed' row = 0.000 < 0.05

Therefore, the null hypothesis is rejected, meaning that there is a statistically significant difference between royalties paid by refined Coal (synfuels) producer and royalties paid by unrefined Coal producer.

Step 3:

Eta squared (η^2) = $\frac{(6.928)^2}{(6.928)^2+(9+9-2)}$ = 0.74999

η^2 = 0.75 to 2 d.p.

Using Cohen's guidelines,

0.75> 0.14 = very large effect

Step 4:

The difference between the mean Rands value of royalty payments of the two classes of producers in the coal sector is as follows:

With the refiner paying more royalties than the miner-only, the magnitude of this difference using their average royalty payments for the years of assessment is R R2,135,379,801.

Econometrics analysis phase 2 of Model 5's assessment.

<u>Realized beneficiation incentive assessment for gold sub-sector</u>

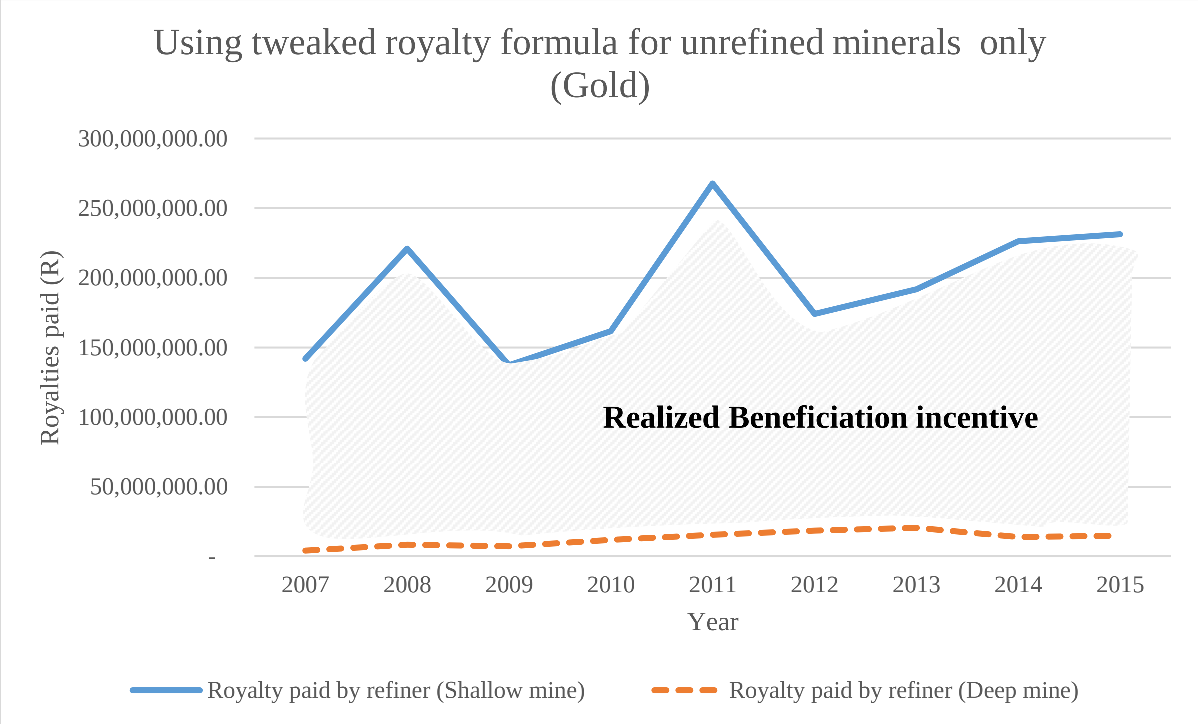

Figure 8.13: Royalty payments for both Gold producers.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.13, it can be observed that the shallow mine gold producer still paid a higher penalty in terms of royalty payments. However, the magnitude of these higher royalty payments was much more than the other five models. Hence, there was no case of realized beneficiation incentive in existence here again; instead, it was the mine that possessed greater revenues that paid greater royalty payments.

Realized beneficiation incentive assessment for PGM sub-sector

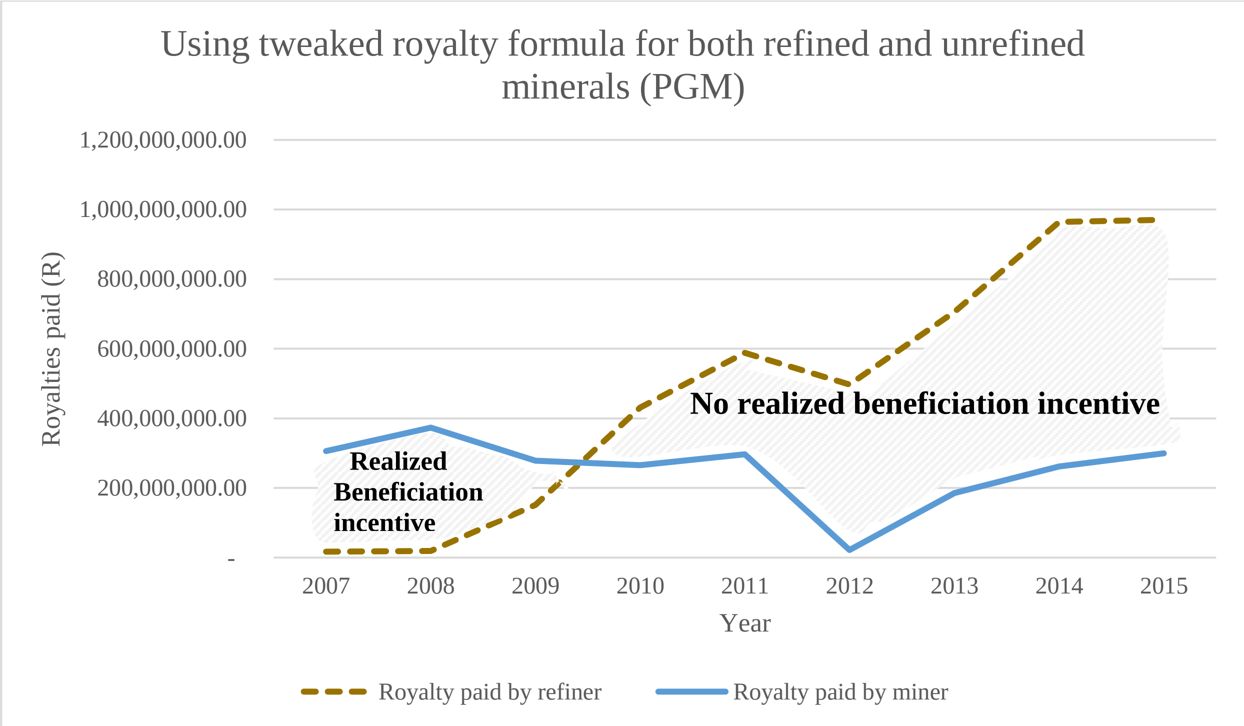

Figure 8.14: Royalty payments for both Refined and Unrefined PGM production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.14, it can be observed that in years 2007 to 2009, the unrefined mineral producer paid a higher penalty in terms of royalty payments. Hence, it appeared that realized beneficiation incentive accrued to the refiner based on the difference in royalty payments in those 3 years. However, from 2010 onwards, the refined mineral producer paid the higher penalty in terms of royalty payments, just like in other models except for model 2. This signified a disincentive to the refiner.

Realized beneficiation incentive assessment for Steel-Iron ore sub-sector

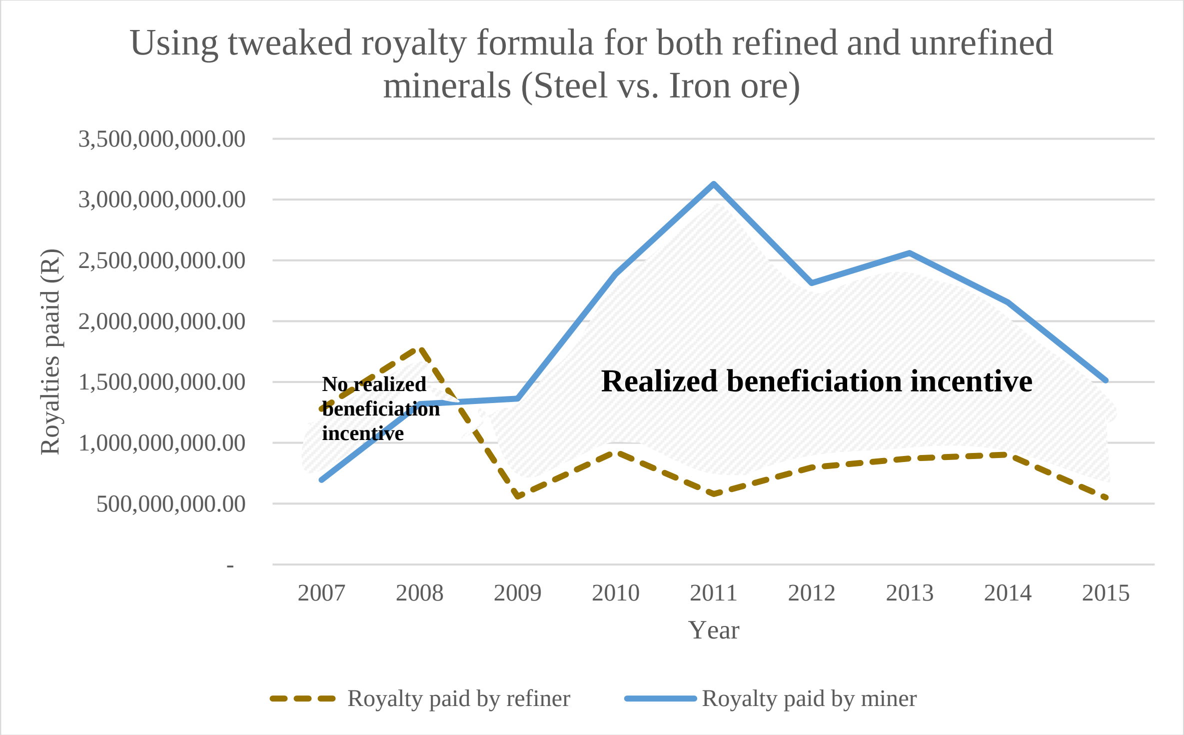

Figure 8.15: Royalty payments for both Refined and Unrefined iron production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.15, it can be observed that the refined production paid higher royalties in 2007 and 2008, more than the values in model 5. However, from 2009 onwards, unrefined production paid a higher penalty in terms of royalty payments. The magnitude of these royalty payments for the unrefined mineral producer was similar to its magnitude in model 4, but the magnitude of the royalties paid by refined producer was much higher than in model 4. Hence, even though it appeared that some realized beneficiation incentive accrued to the refiner from 2009 to 2015 based on the difference in royalty payments, the magnitude of the realized beneficiation incentive was less than that of all the other models.

Realized beneficiation incentive assessment for coal sub-sector

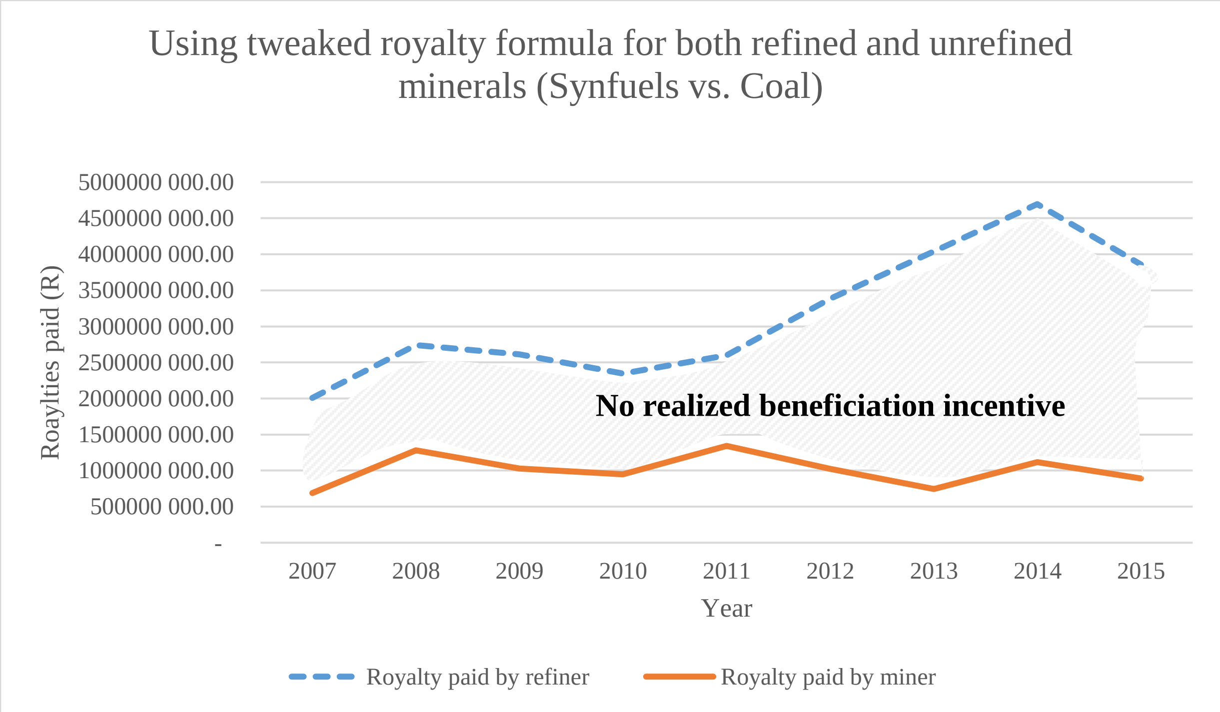

Figure 8.16: Royalty payments for both Refined and Unrefined coal production.

Comments:

Comparing the behaviour of the royalty payments of both producers in Figure 8.16, it can be observed that the refined production paid a higher penalty in terms of royalty payments, and the magnitude of the payments was more than that of all the other models. The magnitude of the royalties paid by the miner-only was also much more than that of all the other models. Hence, no realized beneficiation incentive accrued to the refiner based on the difference in royalty payments.

Table 8.45 provides a summary of the results and interpretations of all the producers in terms of the two econometric assessment phases that were conducted.

Table 8.45: Statement of interpretation of results using tweaked royalty formula for unrefined minerals only.

Commodity sectors	Results and Observations	Interpretation	Deductions
Gold: South Deep mine (refiner) vs. Beatrix Mine (refiner)	Step 1: p-value (Sig.) = 0.000 < 0.05	Variances are not equal.	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of processing; 2. Royalty rate incentive is not applicable here, as it was the producer with the greater revenue (depending on the peculiar economic situation of the producer) that paid greater royalties; 3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference.	
	Step 3: $\eta^2 = 0.90$ to 2 d.p. Using Cohen's guidelines, $0.90 > 0.14$ = very large effect	The magnitude of difference is very large.	
	Step 4:	The difference between the means of royalties paid is R182,043,310.	
	Realized beneficiation incentive assessment:	For all the years of assessment, refiner (deep mine) **paid lesser** royalties than refiner (shallow mine). Shallow mine's royalties were more than when formula for refined minerals was applied.	
PGMs: Mogalakwena mine (refiner)	Step 1: p-value (Sig.) = 0.005 < 0.05	Variances are not equal.	1. Realized beneficiation incentive based on profitability performance for refiner occurred in only 3 years, but wiped out for the next 6 years;
	Step 2:	There is no statistically significant difference.	

Table 8.45: Statement of interpretation of results using tweaked royalty formula for unrefined minerals only (*continued*).

vs. Kroondal mine (miner-only)	p-value (Sig. (2-tailed) = 0.104 > 0.05		2. Realized beneficiation incentive had mixed results but leaned more towards no savings (it was better to be a miner-only as refiner was 'penalized'); 3. The mixed result appeared to support the gold sector case, due to the indication that the level of processing was not the differentiating factor for royalties paid by the different producers. Instead, it was the producer with the greater revenue that paid greater royalties; 4. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 3: η^2 not calculated	The magnitude of difference not calculated because there was no statistically significant difference.	
	Step 4	The difference between the means of royalties paid is R228,423,635.	
	Realized beneficiation incentive assessment:	Refiner paid lesser royalties than miner-only from 2007 to 2009, but from 2010 to 2015, the refiner paid more royalties than the miner-only (but magnitude of refiner's payment was more than when royalty formula for refined minerals was applied).	
Steel_Iron ore: ArcelorMittal Flat steel (refiner) vs. Kumba Iron ore (Miner-only)	Step 1: p-value (Sig.) = 0.028 < 0.05	Variances are not equal	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of processing; 2. Royalty rate incentive was not applicable here, as it was the producer with the greater revenue that paid greater royalties;
	Step 2: p-value (Sig. (2-tailed) = 0.004 < 0.05	There is a statistically significant difference.	
	Step 3: $\eta^2 = 0.44$ to 2 d.p.	The magnitude of difference is very large.	

Table 8.45: Statement of interpretation of results using tweaked royalty formula for unrefined minerals only (*continued*).

	Using Cohen's guidelines, 0.44> 0.14 = very large effect		3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 4:	The difference between the means of royalties paid is R1,019,820,553.	
	Realized beneficiation incentive assessment:	1. In 2009 and 2010, the refiner paid **more** royalties than the miner-only; 2. For all other years of assessment, refiner **paid lesser** royalties than miner-only.	
Synfuels_Coal: Sasol Synfuels SA (refiner) vs. Anglo Coal SA (miner-only)	Step 1: p-value (Sig.) = 0.001 < 0.05	Variances are not equal.	1. Realized beneficiation incentive was possible only because of profitability performance and had nothing to do with level of processing; 2. Royalty rate incentive was not applicable here, as it was the producer with the greater revenue that paid greater royalties; 3. Royalty formula is just a revenue-generator and rent-capturing instrument, not a beneficiation instrument.
	Step 2: p-value (Sig. (2-tailed) = 0.000 < 0.05	There is a statistically significant difference.	
	Step 3: $\eta 2$ = 0.75 to 2 d.p. Using Cohen's guidelines, 0.75 > 0.14 = very large effect	The magnitude of difference is very large.	
	Step 4:	The difference between the means of royalties paid is R2,135,379,801.	

Table 8.45: Statement of interpretation of results using tweaked royalty formula for unrefined minerals only (*continued*).

	Realized beneficiation incentive assessment:	For all the years of assessment, refiner paid **more** royalties than miner-only. Refiner's royalty payments were more than when royalty formula for refined minerals was applied and the magnitude was more than that of all the other models. The royalties paid by the miner-only was also much more than that of all the other models.	4.