# THE NEW SOUTH AFRICAN MINERAL ROYALTY FORMULAE. WILL ALL MINERS BECOME REFINERS? PLATINUM CASE STUDY

**A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Engineering.**

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**DECLARATION**

I declare that this research report is my own unaided work. It is being submitted for the degree of Master of Science in Mining 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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(Signature of Candidate)

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*day* *month* *year*

**ABSTRACT**

South Africa, as the owner of its minerals, introduced the charging of mineral royalties targeting economic rents in 2010. The new royalty also promotes further mineral processing (refining) by rewarding refiners with a reduced royalty payment. Such (fiscal) strategy would stimulate the country's industrial and economic growth and development. This is in line with the main objectives of South Africa's Mineral Policy framework and the Mineral and Petroleum Resources Development Act 2002 (MPRDA), which resulted in the promulgation of the Mineral and Petroleum Resources Royalty Act (MPRRA) in November 2008 for implementation on March 1, 2010.

The MPRRA stipulates a dual *ad valorem*, sliding-scale formula method of charging royalties. This dual sliding-scale formula mechanism imposes no specific rate for any minerals. It is based on profitability and automatically recognizes downstream beneficiation of mineral products as it distinguishes between refined and unrefined minerals. The formula provisions for refined minerals allows for a reduction of the royalty rate as beneficiation increases in order to compensate for the higher sales value of refined products. This aligns with the government's objective to promote local beneficiation of South Africa's minerals for maximum economic benefit.

The purpose of this research is to assess whether this beneficiation objective of the MPRRA would be achieved, thereby ensuring that miners become refiners. To realize this, the methodology used involved a review of beneficiation provisions of past and current mineral royalty systems of some mineral-rich countries. More specifically, applying the lessons from Bradley's work on the Western Australia royalty system to the South African context; extraction of necessary data for a platinum case study; and analyses of the results. The study indicated that miners are unlikely to become refiners as a result of the MPRRA and that further research is required to achieve this national objective.

This research work is dedicated first and foremost to God. Words cannot describe how grateful I am to Him for gracing my life with the ability to realize success over and again in my life's pursuits.

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## KEYWORDS AND ABBREVIATIONS

| | |
|---|---|
| ACP: | Anglo Converting Process |
| Amplats: | Anglo American Platinum Limited |
| C: | Cost of Concentrate |
| Cr: | Cost of refinement |
| Capex: | Capital Expenditure |
| CIF: | Competitive Investment Framework |
| DIAND: | Department of Indian Affairs and Northern Development |
| DMR: | Department of Mineral Resources |
| EBIT: | Earnings before interest and tax |
| GDP: | Gross Domestic Product |
| GNP: | Gross National Product |
| GVR: | Gross value royalties |
| ITA: | Income Tax Act |
| MCP: | Magnetic Concentration Plant |
| MPRR: | Mineral and Petroleum Resources Royalty |
| MPRDA: | Mineral and Petroleum Resources Development Act 2002 |
| MPRRA: | Mineral and Petroleum Resources Royalty Act 2008 |
| NPV: | Net Present Value |
| NSONR: | National Sovereignty over Natural Resources |
| NSR: | Net Smelter Return |
| NWT: | Northwest Territories |
| PAYE: | Pay As You Earn |
| PGMs: | Platinum Group Metals |
| PMR: | Precious Metals Refinery |
| P&SA: | Pooling and Sharing Agreements |
| PV: | Present value |
| RBMR: | Rustenburg Base Metals Refinery |
| RRT: | Resource Rent Tax |

| | |
|---|---|
| SA: | South Africa |
| SADC: | Southern African Development Community |
| SARS: | South African Revenue Service |
| S & R: | Smelting and Refining |
| Stats SA: | Statistics South Africa |
| US: | United States of America |
| VAT: | Value Added Tax |
| WA: | Western Australia |
| UG2: | Upper Group 2 |
| UNECA: | United Nations Economic Commission for Africa |

# CHAPTER ONE

# BACKGROUND, LITERATURE REVIEW AND AIMS OF RESEARCH

## 1.1 INTRODUCTION

It is widely understood by the general public that mineral resources development can lead to creation of wealth, which can deliver benefits to human existence. The minerals industry has been the core of growth of many towns and states world-wide. Its transport and infrastructure requirements have led to development of requisite infrastructure, which has had spin-off benefits to other sectors of the economy (UNECA, 2004). Therefore, this sector has indicated potential to contribute to increased economic growth and employment as further exploration, mineral development and further mineral processing take place within jurisdictions (UNECA, 2004).

Also, with mining accounting for a significant percentage of foreign exchange earnings, significant part of GDP for many mineral-rich countries, their host Governments and citizens understand this wealth-generation potential of their naturally endowed lands and consider it fair for them to share in this wealth. The wealth captured from mining is needed by host governments to fund their responsibilities *vis-a-vis* - social services and infrastructure, environmental protection, economic growth and development, industrialization and improvement of well-being of their citizens. Over time, governments have devised various fiscal instruments to capture their share of this wealth. However, governments do not only use fiscal instruments for revenue-generation but also to facilitate or discourage various kinds of private sector decisions, which include but not limited to, using increased import duties to discourage foreign outsourcing of equipment and services, introduction of capital allowances to encourage investment (Otto et al, 1997).

Wealth cannot be generated from mineral deposits until they are discovered, found to be economically viable to exploit, extracted, processed and transformed into products that can be used in the markets. These operations cannot be carried out without the capital investment into exploration and extraction activities of mining companies. Therefore, in the bid to capture rents (wealth) from mineral development, governments must take caution and put fiscal policies in place that will satisfy their revenue generation objective as well as investors' objectives by allowing sufficient flow of funds in the form of an Net Present Value (NPV) through to investors, so as to attract more investment and prevent them from leaving the country for other more attractive investment (Cawood, 2010).

With the growing knowledge of sustainable development and the limited life span of mineral resources, as well as their susceptibility to price volatility and cyclicality from long-term decline in real prices, host governments of mineral-dependent jurisdictions have understood that there is need for alternative sources of exports and industrialization, in order to ensure sustained and long-term growth and development of their jurisdictions. Mineral endowments do not only possess wealth-generating abilities but can serve as base for industrial opportunities that will lead to future growth and development of mineral-rich regions by "broadening economic linkages that arise as a consequence of the primary extraction activities" (Northern Cape Province, 2005). Some of these industrial opportunities/linkages include- "downstream activities engaged in the further beneficiation or processing of an ore or concentrate; side-stream linkages arising from supply of local goods and services to operating companies; geographic linkages" (Northern Cape Province, 2005). Promoting these industrialization activities provide greater economic benefits for a region in terms of diversification and job creation.

Although, theoretically, it is expected that mineral endowments give comparative advantage to its possessors, with the advent of knowledge-based societies, it has been illustrated that "the availability of natural resources does not automatically confer a

comparative advantage to a country or region rich in resources" (Northern Cape Province, 2005). However, as epitomized by some developed countries like Sweden and Finland, which were formerly mineral-dependent economies but now knowledge-based economies, their mineral endowments proved to be a comparative advantage. Mineral resources only become comparative advantages when they result in products that guarantee sustainable growth of their host region. As the report by the Northern Cape Province (2005) puts it, products from mineral assets are a "more dynamic and sustainable source of growth for a region and have the potential for shifting economic base away from dependence on primary activities along high-tech growth path", enabling these regions to have competitive advantages. The above-mentioned countries used their policies (including fiscal systems for capturing of mineral wealth) to manage and utilize the development of mineral resources (comparative advantage) in ways that caused them "to gradually become a source of competitive advantage" (Northern Cape Province, 2005).

Although as Kumar (1995) opined that one of the emerging themes of the post-World War II and independence era, was "a growing trend in providing for economic developmental elements in mining agreements through incorporation in taxation regimes and investment codes of incentives for increasing the value-added in the host country" and this did not necessarily achieve substantial success in some countries. However, from the turn of the millennium, it has been observed that many mineral-rich developing countries have been looking at revisiting this theme and revising fiscal systems not only to capture greater share in mineral wealth but as a form of development strategy that will encourage beneficiation and establishment of economic linkages from mineral development like South Africa, Brazil, Mongolia.

The main focus of this research, therefore, is to assess the use of the new South African Mineral and Petroleum Resources Royalty (MPRR) regime not only for its revenue-generation objective but its provision of beneficiation (refining) incentive in order to facilitate further mineral development by encouraging mining companies to

move-up the Value-chain to become refiners. South Africa seeks to use this royalty regime as a way of capitalizing on the economic advantages of its mineral sector to facilitate the diversification of her economy by encouraging the existence of more refining facilities from extractive ones.

This report starts its literature review by generally looking at the evolution of mining fiscal instruments (herein after referred to as Mineral taxation instruments) and the different types of mining taxation systems; narrowing mineral taxation down to mineral royalty instruments (which is in line with the main focus of this report). It then gives definition of mineral royalty and its different types; highlights examples of countries which have custodianship of minerals and in line with South Africa's *ad valorem*/hybrid royalty type; and dealing with South Africa's MPRR specifically, its provisions especially its beneficiation initiative. The methodology used in this report will involve the application of Bradley's recommendations to the new South African MPRR regime's beneficiation provisions so as to check if the financial position of mining companies would improve significantly. The report will end by drawing conclusions and making recommendations.

However, the scope of this report does not include assessing the technical soundness of the parameters of the regime are but only covers assessing if the regime's provision of reduced rate for refined minerals is enough incentive to encourage mining companies to add-on establishment of beneficiation facilities.

This study was confronted with limited availability of up-to-date requisite mineral royalty information of different countries as well as company data.

## 1.2 LITERATURE REVIEW

### 1.2.1 Mining Taxation

It is known that "mining normally creates wealth" (Otto et al, 2006). Different stakeholders – mining company, host governments, communities, citizens etc. lay claim to the wealth potential.

Extensive literature is available to support the fact that host governments of mineral-rich economies have rightful claim to benefits from mining activities. Gonzalez (2004), stated that "the countries, regions and localities where mining activity takes place, should have direct share in the wealth created by mineral exploitation in their jurisdictions, in a way that translates into an improvement in their inhabitants' quality of life and level of well-being". She further stated that host governments (on behalf of their citizens) sharing in the wealth "is an appropriate reciprocity for reduction in natural capital resulting from exploitation of non-renewable resources, an exploitation that can generate significant negative impacts".

The paper written by Sunley and Baunsgaard (2001) also highlights that host governments should be rewarded for exploitation of their resources which "can only be exploited once".

As mentioned earlier, host governments need the wealth realized from mining to fund their socio-economic responsibilities. Generation of wealth from mineral resources is only possible through the activities of mining. The wealth potential of these deposits drives mining companies to invest capital to fund exploitation and they require that sufficient profits are realized on such capital, so as to maximize shareholders' wealth, and sustain their market positions. All through history, the differing objectives of government and companies and the optimal distribution of rents (economic surpluses/wealth) between both parties, have always raised critical concern and been

on the front burner of academic and industry-based discussions (Cawood and Minnitt, 2001).

It is widely accepted for discriminatory taxation to be applied to mineral sector as different from all sectors of the economy, based on the understanding that mineral development is unique. According to Otto et al (2006), "for tax purposes, many countries consider mining and mineral sector special". This is supported by Sunley and Baunsgaard (2001), who gave a "Yes" answer to the question of whether the mineral sector requires a specific taxation regime. The reasons for this 'specificity and uniqueness' position lie in following:

- the dominant role that the mining sector plays in some countries, accounting for a large share of all government revenues and foreign exchange earnings (Otto et al, 2006);
- mineral development exploits a non-renewable resource (Otto et al, 2006);
- risk and uncertainty associated with geological conditions of the resource (Kumar, 1995); and
- its special characteristics in terms of lengthy periods of exploration in which there is no revenue; risk of funding uneconomic deposits; large amounts of capital investments – human, physical, financial etc. required; capital is captive and not transferable once the mine is built; long-lead periods before mining operations can commence to extract, process, and produce mineral resources; requirements of specialized equipment, which are available from only a few manufacturers worldwide so it must be imported; mines can have long lives and will be subject to regime changes and political instability; volatility of commodity prices resulting in cyclicality of revenues; requirement of large reclamation costs when project ends etc. (Otto et al, 2006).

Taxation policies relating to the development of mineral resources have both economic and political dimensions, which have changed substantially over the years (Cawood and Minnitt, 2001). Kumar (1995) discussed the evolution of mining

taxation and emerging taxation themes from the pre-world war II era. Some of the themes include State sovereignty; introduction of new tax forms – income tax, Resource Rent Tax (RRT) in place of/and with royalties; introduction of tax-exemption provisions such as tax holidays, capital allowances; creation of state-owned mining enterprises; evolution of royalty systems in relation to price movements.

In the pre-World War II era, the colonial authorities gave out mining rights and titles over large areas for between 30 – 100 years and required that only Royalties (which were mainly computed unit-based on production volume/weight and value-based on amount of Ore sold) be paid to government (holders of title) and/or local citizens (holders of mining claims and titles to land), income taxation hardly existed then. The royalty fiscal instrument was considered to be an easy type of tax to administer and it assured governments of certain amount of payment receipts as long as there was production or sale of mineral products. The fiscal burden on investors was light at that time because of low royalty rates.

More specialized mining taxation regimes began to evolve all over the world especially in developing countries, after World War II and independence. During this period, economic development increased, resulting in increase in demand for minerals and fuels. This allowed investors (from colonial districts, developed countries) to reap the benefits from the price boom created by increased demand. They began to be viewed as having high advantage over governments of developing countries since their royalty payments were low. In order to combat this, from the 1960 - 1970s, many mineral-rich economies progressively took a socialist approach to mineral development. They became hostile to investors because these countries viewed mining investors as encroaching on the use of their natural endowments without necessarily allowing substantial benefits to accrue to the State. By the 1980s, mining investors began to abstain from these socialistic countries (mainly developing countries) to invest in those that were more open (developed countries) like the US,

Australia and Canada. Upon realization that there was no value received if mineral resources are left in the ground because mining investments were moving from their countries and with the failure of their state-owned enterprises, national economic planners began to soften policies in the 1990s. Fiscal policies became lenient with different provisions for tax relief in order to attract investors (Kumar, 1995).

Howbeit, from the mid-nineties to present time, the themes- competitive nature of today's global industry, sustainable development, resource-based industrialization coupled with the effects of mineral-rich economies seemingly missing out of commodity price boom before the recession of 2008 and 2009, the global economic recovery of 2010, and the continued desire by governments to obtain a fair share- have indicated the need of mineral-rich economies (especially developing countries) to update their mining taxation policies so as to avoid history repeating itself.

As epitomized by developed countries like Sweden and Finland, who used their mineral development and mining revenues to provide side-stream and downstream linkages, it can be adduced that well-managed primary mining activities can lead to diversification of the economy. Incorporation of value-addition incentives in mineral legislations of host countries can facilitate such resource-based industrialization. The new South African MPRRA is an example of such legislative initiatives that includes such incentives in order to encourage diversification of economy and expects this to be a success. This paper seeks to verify this notion.

From the foregoing, before governments can seek greater share of revenue from mineral development, they must consider that mining companies are not philanthropists but are business entities focused on making profits and therefore need to survive and succeed especially in recognition of the fact that mining operations "do not automatically end with more money in the hands of the mining company" (Cawood, 2010). Mining companies view taxes as additional costs and therefore assess the content and design of mining taxation regime of their proposed mining

jurisdictions, in light of receipt of enough compensation for their investment risks and its effect on their business' profitability (Otto et al, 1997). Before capital investments are made into a mining project, risks and uncertainties surrounding the profitability of the project are highly considered, because the ability of mining companies to successfully contribute to long-term sustainability of any society depends on the guaranteed survival and success of their projects. This alludes to the fact that governments as well as mining companies require some form of compensation for going ahead with mining operations. Likewise, companies involved in mineral beneficiation/value-adding require large amounts of capital investments for their operations and need compensation to ensure their successful existence.

Therefore, in extending the benefits of mineral extraction and beneficiation sectors to support socio-economic and developmental issues, as aforementioned, the major concern of the appropriate yardstick for charging of royalty/taxes needs to be addressed.

Host Governments use rent (wealth) capturing instruments to accrue sufficient revenue from their natural endowments. However, in the current era, where there is increased global demand for scarce capital, it is in the best interest of host governments to develop stable taxation instruments that will incentivize the influx of capital (investors) to carry-out of efficient exploitation and development of mineral resources, as "it is no use having minerals in the ground if they cannot be extracted and beneficiated to result in tangible assets" (Otto, 1995). Such optimal investment environment will result in generation of greatest possible value for company and government's interests.

The business objectives of mining companies inform their expectations of tax policies of proposed jurisdictions. These include taxes that:

a. are responsive to realized profitability as opposed to conceptual or anticipated profitability, in other words, based on 'ability to pay";

b. permit early payback of invested capital;
c. are sensitive to volatility of revenues (price cycles);
d. are stable, predictable and transparent to reduce risks;
e. are ring-fenced to cash flow generated from a mining project (mining income) only, not non-mining income (other corporate income);
f. do not distort costs and extraction profiles;
g. encourage exploration risks taking to find new deposits or expand existing mines;
h. do not discourage investment in economically marginal projects; and
i. preserve incentives for a company to invest in project improvements over time. (Otto et al, 1997)

Governments also want taxes that:

a. maximise the present value (PV) of locally retained earnings consistent with the promotion of efficient levels of recovery and minimize disincentives for investment in new discoveries;
b. minimise environmental damage and the ensure that firms will compensate for the damages that result from mining;
c. create economically useful forward and backward linkages to the local economy, including employment, value-added investments, local purchasing and technology transfer opportunities;
d. are sensitive to the social and cultural needs of local communities including their economic and social viability after the mine closes;
e. are internationally competitive;
f. support macroeconomic stability by providing predictable and stable tax revenue flows;
g. permit capturing a greater share of revenues during periods of high profits and from extraordinarily low cost, high profit projects;
h. can be effectively administered and involve low collection costs and possibilities for avoidance; and

j. are neutral and encourage economic efficiency. (Otto et al, 1997)

According to Otto et al (1997 and 2006), both government and mining company's objectives would be met if a taxation regime is designed with the following characteristics taken into consideration, which are:

a. Neutrality: A neutral tax should minimise incentives that will influence favouring more investment decisions towards the mining sector against all other sectors of the economy.
b. Efficiency: An efficient tax should be internationally competitive, yet sufficiently facilitating the promotion of macroeconomic stabilization and growth.
c. Equity: An equitable tax should provide fairness in allocation of burdens between both government and mining enterprises.
d. Clarity: This relates to the ease of understanding the regime, its cheap administration and "the transparency of the entire regime" (Cawood and Minnitt, 2001).
e. Stability: A good tax regime should be stable over time, in order to reduce the perception of high risk in jurisdictions, leading to greater share of wealth from mining to government.
f. Predictability.

There are different types of mining taxation instruments used by government to capture rent from mining. These include:

i. Direct taxes – income tax, property/land tax, capital/wealth tax, royalties; and
ii. Indirect taxes – VAT/sales tax, excise taxes, special taxes, payroll taxes.

Extensive literature exists on these various types of fiscal instruments, their purpose and timeliness of revenue flow to governments. According to Cawood (2010), the order of revenue receipts by governments is first from mineral royalties (based on production, revenue or profit); middle – income taxes on profits; and last – in the

form of instruments such as RRT, dividends tax. However, to avoid going beyond the scope of the research, this report will focus on mineral royalties.

### 1.2.2 Mineral Royalties

Over the years, countries, regions and localities where mining activity takes place, have agitated for demands that the exploitation of the mineral resources in their jurisdictions should result in more visible benefits. They have insisted that by sharing in the mineral wealth generated, they can fund programmes that result in the improvement of well-being of their citizenry. Their share in the mineral wealth is taken as an "appropriate reciprocity for the reduction in natural capital resulting from exploitation of their non-renewable resources, an exploitation that can generate significant negative impacts" (Gonzalez, 2004). It has therefore emerged as an indisputable principle that it is just and necessary for the State, as owner of the minerals, to impose a charge or compensatory fee for the exploitation of these non-renewable and scarce resources.

The usual practice of capturing their compensatory share of mineral wealth has been primarily through the use of mineral royalties. With the established international law of National Sovereignty over Natural Resources (NSONR), this has given further effect to States that have custodianship of mineral resources vested in them, to impose and charge royalties. These mining royalties represent the minimum compensation due to the country (owner of resources) for the depletion of its non-renewable resources that are extracted from its land and sold in markets (UNECA, 2004).

With the re-emerging theme of mineral-rich countries striving for the realization of greater direct share in wealth produced by mineral development in their jurisdictions and more requirements (by mineral law) to foster other socio-economic linkages

from mineral development programmes, this has instigated renewed interests in reviewing and redesigning their mineral royalty regimes (Cawood, 2010).

Mineral royalties are one of the oldest and most effective forms of mining taxation. It has been given many definitions, which include:

"…payment due to the sovereign owner in exchange for the right to extract the mineral resource…" (Otto et al, 2006)

"Royalties are the sum of cash payments and benefits that owners receive when property use and mineral ownership is transferred to another party….and it is a tax charged directly against the mineral deposit or inputs used to exploit it which serves as a compensation for depleting the resource over time" (Cawood, 2010)

Any appropriate royalty regime must comply with the principles of a good minerals taxation regime, which include but not limited to, neutrality, efficiency, predictability, equality, stability. As it also applies to mining taxation in general, it is important to note that in charging mineral royalties, it must take into consideration the uniqueness of the mineral resource (as reflected in the sales price and cost of delivery), in terms of differing location, quality, quantity, type, its mining process, its resultant rewards and the appreciation that a mining process does not automatically end with more money in the hands of the mining company (UNECA, 2004).

There are five (5) broad categories of royalties:

1. Production royalties: These are the oldest form of royalty payment used internationally (Otto et al, 2006). They are unit-based, levied per either volume or weight of production and "expressed in the same unit as the resource i.e. amount per tonne" (Cawood, 2010). They are calculated by multiplying the rate per unit with the rate of production. Although it is more straightforward to apply as compared with other categories of royalties, one of its shortcomings

arises when it comes to dealing with the differentiated markets for minerals and their products as we have today. Applying unit-based royalties to these differentiated markets require unique rates for each mineral product at different stages of beneficiation, leading to a comprehensive list of mineral products against royalty rates, and must be frequently revised when new minerals become useful and others are replaced by new materials (Cawood, 2010).

2. *ad valorem* royalties: These are value-based royalties, levied against value of mineral contained in the ore at mine mouth, sales value of first product, gross revenues derived from sales less certain allowable costs, net smelter return (adjusted for smelting and refining costs) etc. (Otto et al, 2006). They are calculated by multiplying the percentage rate with the value amount of the mineral. The rate can be fixed or determined by formula. Fixed royalties have similar problems with unit-based royalties in that these also require a comprehensive table stating mineral products at various stages of beneficiation against their respective royalty rates (Cawood, 2010). However, value based royalties are structured in ways that allow the payment to fluctuate according to commodity prices.
3. Profit-based royalties: These are royalties based on the ability to pay or some measure of profitability (Otto et al, 2006). Generally, it takes into account the value of mineral produced and certain allowable costs but ignore return on capital. It is a complex form of royalty regime and mainly used by countries where a well-developed and well-equipped tax administration systems exist.
4. Hybrid royalties: This involves the combination of profitability with value- or unit-based royalties. This type of regime distinguishes between low-profit and high-profit mines and ensures that royalties flow into the fiscus at both low and high times of profitability (Otto et al, 2006).
5. Quasi-royalties: These could be any alternative arrangements to mining royalties. They can take forms of State partnership or percentage equity ownership; creation of State mining enterprises for establishment of control over exploitation and use of minerals especially strategic ones; production

sharing arrangements (Sunley and Baunsgaard, 2001), lump sum (fixed fee) payments (Cawood and Minnitt, 2001), Resource Rent taxation (charging taxes on excess returns obtained after the threshold of the company has been met); service arrangements (management contracts to private companies from government in return for a share of mineral production) and auctioning of developments rights (Cawood, 2010).

In the opinion of Gonzalez (2004), countries where a compensatory fee for mineral exploitation is still not charged, should address the deficiency.

### 1.2.3 Mineral royalty systems in different countries

The aim of this section is to take a few examples of countries having custodianship of their minerals that use *ad valorem* or hybrid royalty systems showing the history and current structure of their regime and checking if they contain beneficiating incentives. In a later chapter, the success or not of their provisions would be assessed to see if South Africa's royalty regime can draw any lessons therefrom. The constraint of this section, however, is the lack of access to up-to-date detailed information on the royalty regimes of many countries especially as regards provisions to facilitate beneficiation, the analysis of the regimes and what the impact of regimes have been on investment and operations.

#### 1.2.3.1 Ghana

Ghana is endowed with substantial amount of mineral resources and has a well-established mining sector which accounts for 5% of the country's GDP. The industry has grown considerably in recent years to represent an important pillar of the Ghanaian economy (Bermúdez-Lugo, 2009). Between 2000 and 2008, the mining sector contributed an average annual 11% of Government Revenues collected in the form of corporate tax, PAYE and royalties. The sector continued to be the single

largest contributor of royalty, accounting for an average of about 98% of the total royalties paid to government over the past 10 years.

The legislative framework for the mining sector in Ghana was initially provided by the Minerals and Mining Law of 1986 (PNDC Law 153). It was passed in order to offer incentives to the mining industry and it included provisions of generous capital allowances, reduced income taxes, external foreign exchange retention accounts and a flexible royalty payment system. Under this Law, mining companies were required to pay royalties and corporate taxes at standard royalty rates. The royalty rates were based on a sliding scale of between 3% - 12% of the total revenue of minerals produced, and applicable to the operating profit margin of the company. According to Ayi (2010), that regime "provided for flexibility in royalty and corporate income payment schedules, and in particular, it empowered the minister responsible for mining to use his discretion to grant any request from distressed companies for deferment of royalty payments".

However, the Minerals and Mining Law of 1986 was amended in 1994 and 2005. In 1994 amendments, the 45% general mining corporate tax rate was reduced to 35%, and this rate was the same as that imposed on other industries.

In the light of changes in the international mining scene, from the early 2000s, the Law of 1986 needed further revisions. The 2005 amendment was enacted as the current Minerals and Mining Act 703 of 2006. It included changes to royalty rates and the establishment of the period of duration of a mining lease. One of the main objectives of the new Act 703 of 2006 was to provide a royalty regime that will counteract market fluctuation, through automatic stabilization. The royalty rates specified varied between 3% – 6% of the gross market value of minerals sold. The variation was related to the operating margin, taking into account the profitability of the mine and designed not to be too onerous for marginal mines or in times of low profitability (Fobih, 2007) while reciprocally getting higher rate contribution from

other mining projects when times are good, especially when windfall profits were made. This was to ensure efficient and equitable mobilization and distribution of the benefits of mining (Chen, 2009).

In 2010, the budget statement stated that to a large extent, mining companies were settling for the minimum 3% royalty payment or a little more, despite the significant gains they were making on the international market. Also, the Chamber of Mines commented that "the current 3% is too meagre to allow any meaningful development projects by the traditional authorities, and therefore it must be increased" (Business Times, 2010). Based on these, the government resolved to change that order and maximize revenue from the sector as part of its revenue mobilization programme. The royalty payable by the mining sector to the government was increased from 3% to 5%. The proposed regime for the mining companies apart from increasing the minimum mineral royalties, in addition, intended to engage all mining companies to address the issue of dividend payment, exemptions, reduction of tax evasion and ensuring a fair mining sector fiscal regime that is more efficient and less dependent on indirect taxes (Business Times, 2010).

In summary, Ghana has an *ad valorem,* sliding-scale system that is dependent on profitability, which is similar to South Africa's MPRR regime's provision of placing no specific rate for charging royalties on minerals plus its profitability dependence. In a later chapter, it would be examined to observe if this system made Ghana's mining industry more investor-attractive.

#### 1.2.3.2 Mongolia

The Minerals Law of Mongolia previously provided that the holder of a mining license must pay:

a. A standard royalty calculated on the basis of the total sales value of the minerals extracted. The standard royalty rates were 2.5% for coal and

commonly occurring minerals sold in Mongolia; and 5.0% for all other minerals (i.e. coal sold abroad, commonly occurring minerals sold abroad and minerals that are not commonly occurring, either sold in Mongolia or abroad); and/or

b. Levied a 68% windfall profits tax on the sales of gold subject to certain conditions; on sales of copper ore and copper concentrate in excess of a base price set at US$2,600.00 per tonne. For copper concentrate, the windfall tax was calculated on the difference between actual copper prices on the London Metal Exchange and the sum of the base price and smelting costs. Copper products such as copper cathodes were exempt from the windfall profits tax.

On November 25, 2010, the parliament of Mongolia, adopted an amendment to Article 47 of the Minerals Law of Mongolia. The amendment introduced a new surtax royalty that became applicable from January 1, 2011. The new royalty regime is sliding-scale, value-based (price & degree of processing) and per mineral type, in other words:

- it includes a surtax royalty which does not modify the standard royalty regime but rates are imposed in addition to the standard flat-rate based on the total sales value of 23 types of mineral, varying from 1% to 5% for minerals other than copper; and
- The new surtax royalty replaces a previously applicable windfall profits tax;
- The rates are significantly higher for copper than for other types of minerals with the surtax royalty rates ranging between 22% and 30% for ore, between 11% and 15% for concentrates, and between 1% and 5% for final products.

The provisions of the new surtax royalty allow the rates: to vary depending on the type of minerals, their market prices and their degree of processing and are not charged on any minerals below a certain threshold market price per mineral type. This new regime also includes provisions to encourage mining companies to engage in value-added activities, as the rates are lower for processed materials than for

unprocessed minerals. The Ministry of Mineral Resources and Energy determines the reference price of minerals for export purposes (and possibly for surtax royalty purposes) on the basis of prices in the international minerals markets. The new surtax royalty rates are imposed only at one stage during the process of mineral production, in other words, if a royalty has been charged on mineral ore, no further royalty will be charged on its mineral concentrate or on final products (Aldrich et al, 2011).

This royalty ideology is close to South Africa's MPRR regime but because it is at a fledgling state, it would be difficult to test if many mining companies have been encouraged to engage in value-addition activities through its provisions.

#### 1.2.3.3 Canada (Northwest Territories)

In Canada, royalties are purely profit-based. Many of its jurisdictions have mineral royalty regimes that allow for special processing allowances in order to encourage further mineral processing within their provinces or territories. For this country example, The Northwest Territories (NWT), would be focused on.

In the NWT, the Department of Indian Affairs and Northern Development (DIAND) is responsible for the management of water, hydrocarbon and mineral resources as well as under the provisions of the Territorial Lands Act and its regulations, it is responsible for the administration of most Crown land.

According to Paget (2001), as directed in the Federal budget in February 1995, the DIAND initiated a comprehensive review of the mining royalty regime specified under the Canada Mining Regulations. The objective of this review process was to ensure that the mining royalty regime in the NWT:

i. generates a fair return from the extraction of Crown minerals to the Crown as well as the private sector developers of minerals;
ii. maintains a competitive level of income tax/mining royalty on the profits;

iii. treats mines of varying levels of profitability equitably; and
iv. is clear, straightforward and simple to interpret and administer.

In NWT, the mining royalty regime before the review required each mine to pay an annual royalty to the Crown levied against the mine-mouth value of minerals produced. The mine-mouth value of output was defined as the market value of the mine production after allowable deductions for such items as:

a. transportation, concentrating, smelting and refining costs;
b. mine and mill operating costs;
c. exploration and development costs at the mine;
d. depreciation of the buildings, plant, equipment and machinery used in production at the mine (an allowance of up to 15% of the cost of depreciable assets not to exceed 100% of the original cost of the assets);
e. amortization of preproduction exploration and development costs (an allowance of up to 15% of such costs incurred prior to commercial production not to exceed 100% of these costs);
f. exploration expenses incurred elsewhere in the NWT up to 10% of market value of production; and
g. if the production is further processed in the NWT, a processing allowance of 8% of the cost of processing assets to a maximum of 65% of the value of output. (Paget, 2001)

The Royalty charge was levied on a sliding-scale basis, on value of output as following:

- $10,000 to $1 million: 3%;
- $1 million to $5 million: 5%;

The rate increases by 1% for each additional $5 million in value of output (profit), up to a maximum of 12% at a value of output of $35 million and above (Paget, 2001). The sliding-scale royalty rate in the NWT resulted in an effective royalty rate that

generally increased with both profitability and size. Other provisions of the regime included that no royalties were required to be paid for the first 3 years after the start of commercial production. In the NWT, mining royalty is charged by the federal government and limits the claims for processing allowance assets within its jurisdictions.

The review process looked into the following issues stated below, although not all inclusive. There were suggestions for the revised royalty regime to:

1. apply different royalty rates for different minerals, as in the case of diamonds;
2. increase the royalty rate on profits between $10,000 and $1 million from 3% to 5%, which would be the same rate placed on profits between $1 million and $5 million; and
3. in order to ensure that the Crown receives a fair return on its mineral resources from larger and higher profit operations, the maximum royalty rate should be increased from 12% to 14%. At that time, the 12% rate applied to profits of $35 million and above. Under this proposal, profits from $35 million to $40 million would remain subject to the 12% rate, profits between $40 million and $45 million would be subject to a 13% rate and profits of $45 million and above would be subject to a rate of 14%. (Paget, 2001)

After technical evaluations and comparisons of diamond mines with other mineral-producing mines, the review committee rejected the suggestions for separate royalty regimes for different minerals based on equity criteria. It stated that since diamond mining was not so significantly different from a technical perspective from other mineral production, there was “no justification to levy a different level of royalty on two mines of equal profitability just because they happen to produce different minerals” (Paget, 2001).

After the review process, it was concluded that the mining royalty regime would continue to apply to all minerals regulated by the Canada Mining Regulations,

including diamonds but it was revised slightly in favour of the recommendations to increase the initial and maximum royalty rates.

As at 2006, the royalty regime was sliding-scale and profit-based, with rates varying on output value from an initial rate of 5%, graduating to a maximum rate of 14% (Otto et al, 2006). It had no provisions for application of different rates for different minerals. Thereafter, no major changes have been made to the royalty regime, and this was echoed by the Natural Resources Canada bulletin (2011), which stated that "Canadian royalty regimes had made no major reviews in recent years".

Therefore, in summary, NWT's sliding-scale profit-based royalty regime has inclusive mineral processing incentives.

#### 1.2.3.4 Western Australia

Mineral production in Western Australia is very diverse. The range includes some 50 different minerals in commercial production – far greater than in any other State or Territory in Australia (Department of Mines and Petroleum, 2011). In Western Australia, two of the major sources of State revenue are mining and petroleum royalties.

Mineral royalties were collected under either the Mining Act 1978 (WA) or Agreement Acts which were negotiated for individual projects. The Mining Act 1978 (WA), states that all minerals "existing on or below the surface of any land in the State in its natural condition is the property of the Crown", and provided that royalties were payable on all minerals by the holder of, or applicant for, the mining tenement where minerals are found. It made provisions for the Minister for Mines to exercise discretion and determine by what method a value shall be placed on a mineral for the purposes of assessing the rate of royalty and the basis on which a rate of royalty shall be applied.

After this, royalties became payable either under the Mining Regulations 1981 (WA) or various State Agreement Acts. The Regulations stipulated the rates of royalty for all minerals except for gold and neither the rates nor the method of calculating them were uniform. It specified the use of two systems of mineral royalty collection. Some materials were rated as:

- Specific rate: They are quantity-based royalties, expressed as flat amount per tonne and used for low value construction materials. They were calculated on tonnes produced at either 30 cents per tonne (aggregate, clays, dolomite, gravel, gypsum, construction limestone, rock salt, sand and shale), or 50 cents per tonne (building stone, metallurgical limestone, pyrophyllite, silica and talc); and
- *ad valorem*: They are value-based royalties and expressed as percentage of 'royalty value' of the mineral. The royalty value is defined in the Mining Regulations 1981(WA) as gross revenue less smelting, refining and transportation costs.

All other minerals apart from construction materials were rated as a percentage of the realized value at rates of 7.5% (for bulk material that had been subject to limited treatment – bauxite, calcite, diamonds, gems, precious & semi-precious stones, iron ore [lump ore], manganese and quartz crystal; 5% for concentrate material with some minimum value per tonne - garnet, ilmenite, leucoxene, rutile, nickel and zircon; and 2.5% for metal (cobalt, mercury, platinoids, silver).

This system took into account price fluctuations and grade of material. The different rates were also intended to adjust for the change in the value as mined ore is processed and value is added (Department of Mines and Petroleum, 2011).

From 1 July 1998, the Western Australian government removed gold producers from being exempted from paying royalties as recommended by Bradley's Mineral

Revenues Inquiry (1986), and introduced for the first time a royalty on gold. However, the Regulations allowed special provisions for gold royalties which included certain exemptions for smaller producers, lower royalty rates than most other minerals and transitional arrangements "that were aimed to placate the complaints and concerns of the gold mining sector regarding the potential uneconomic nature of many producers if they became subject to royalty payments" (Calzada, 2000).

From the year 2000, Western Australia reviewed its mineral royalty rates as regards some minerals – coal, copper, cobalt, oil shale. From 1 July 2005, other changes were limited to increasing the 30 cent per tonne and 50 cent per tonne flat rates to take into account increased commodity prices. Table 1.2-1, shows some of the revisions:

Table 1.2-2: Royalty rates for different mineral commodities in WA

| **Mineral** | **Royalty Rate (as at 2 May 2010)** | **Basis of Calculation** | **Last review/change** |
|---|---|---|---|
| Bauxite | 7.5% | *ad valorem* | No recent change |
| Coal | If exported: 7.5%<br>If not exported: $1/tonne (adjusted each year at 30 June in accordance with comparative price increases) | *ad valorem* and quantum rate | 2006 – *Mineral Resources Development (Amendment) Regulations 2006* |
| Coal Seam Gas | Same rate as petroleum | *ad valorem* | No recent change |
| Cobalt | If sold as concentrate: 5%<br>If sold in metallic | *ad valorem* and quantum rate | 2000 – *Mining Amendment Regulations (No. 4)* |

| | | | |
|---|---|---|---|
| | form: 2.5%<br>If sold as nickel by-product:<br>$/tonne calculated using the gross cobalt metal price per tonne | | *2000* |
| copper | If sold as concentrate: 5%<br>If sold in metallic form: 2.5%<br>If sold as nickel by-product<br>$/tonne calculated using the gross copper metal price per tonne | *ad valorem* and quantum rate | 2000 – *Mining Amendment Regulations (No. 4) 2000* |
| IronOre | Beneficiated Ore: 5%<br>Fine Ore: 5.625%<br>Lump Ore: 7.5% | *ad valorem* | No recent change |
| petroleum | Onshore petroleum: 5-10% of wellhead value for primary licences. 10-12.5% for secondary licences.<br><br>Offshore petroleum: 11-12.5% of wellhead value. | *ad valorem* | No recent change |

Source: Bowie (2009)

From 1 July 2010 up till 30 June 2015, the flat rates on production would be calculated with reference to the Non-Metallic Mineral Products Price Index, which are:

- 62 cents per tonne (construction use); and
- 100 cents per tonne (used for its metallurgical content)

The rates will be reviewed in 2015.

In summary, Western Australia has both unit-based and *ad valorem* royalty systems. The *ad valorem* system is profitability dependent and charges lower royalties on value-added mineral products so as to encourage local processing.

1.2.3.5 The South African context on mining royalties

The Republic of South Africa is generously endowed with a significant amount of high grade mineral resources. Currently, South Africa is one of the world's largest producers and exporters of platinum, overtaking gold as her largest foreign exchange earner; and a significant producer of gold, manganese, chrome, vanadium, titanium and coal. (Bureau of African Affairs, 2010)

With these vast mineral resource endowments of the nation, the positive role that these endowments play in the Republic cannot be overemphasized. In the present era of open-trade between countries, these mineral resources help to foster the following (the list below is not exhaustive):

i. stable inflow of revenue from mining royalties and taxes into the fiscus;
ii. international trade for marketing of mineral products;
iii. Foreign exchange earnings from exportation of goods;
iv. inflow of foreign direct investments in exploration and exploitation;
v. training of local citizens/miners;

vi. local demand for the promotion of infrastructural development, which increases the economic viability of its metals and industrial minerals deposits; and
vii. beneficiation (value-adding) activities and refining of mineral fuels.

With the mineral sector serving as a pillar of South Africa's economy, a balance has to be reached in order for present and future generations/stakeholders to equitably benefit from present day mining operations. The South African Government having been vested with requisite authority as the custodian of its mineral resources by Mineral and Petroleum Resources Development Act, 2002 ("MPRDA"), is responsible to ensure that the exploitation of its mineral resources makes a beneficial contribution to the living standards of every citizen of the Republic. The Government is therefore authorized, amongst other things, to:

i. determine necessary procedures for mineral development;
ii. grant mineral rights to applicants who demonstrate adequate technical, financial and managerial capability to engage in exploitation activities that will benefit the state;
iii. charge royalties and taxes for any transfer of resources;
iv. provide a stable environment in terms of cost of public services and goods, which would be attractive to investors;
v. provide state support for research exploitation techniques;
vi. provide effective dissemination of non-confidential, State-held geological information; and
vii. review of policies and regulations that constrain downstream development (Northern Cape Province, 2005).

In order to effectively reap rightful and meaningful benefits from the development of the natural resource endowments of the country for sustainability of the well-being of the present and future generations of South Africans, as mentioned above, the Mineral and Petroleum Resources Royalty Act 2008 ("MPRRA") gives the government rights to charge a royalty for any transfer of mineral and petroleum

resources. The receipt of royalty from the transfer of mineral resources to an extractor is aimed at compensating States for their irreplaceable, non-renewable resources, for sustainable investment and development with a view of improving the economic well-being of the nation.

According to Cawood and Minnitt (2001), a cash flow analysis was carried out to determine the government's share of rents, and it was found that corporate income taxes were by "far the most important contributor to State revenue", with mineral royalties forming the second most important source of income. However, with the limited lifespan of its mineral resources, the government understood that relying only on mining taxes and royalties was not sustainable. This made diversification and strengthening of other sectors of the economy a *sine qua non*. Currently, the promotion of industrialization approaches such as agro-processing, manufacturing and mining beneficiation are major areas of government-focus and are viewed as necessary to assist in tackling the country's challenges, ensuring sustainable economic growth and development.

The royalties paid to government from mining activities can be used to fund the required "shift of the country's industrial base from its current dependence on natural resources along a high-technology growth path" (Northern Cape Province 2005). Therefore, it is an accepted economic view that the government should ensure that the mining industry should make a "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 royalty and taxes charged must be such that ensures that the business environment remains competitive and most importantly attractive to investors, particularly foreign investors.

#### 1.2.3.6 The MPRRA Regime

From as far back as 1878, collection of mineral royalties had been used as an instrument of obtaining surplus revenues from mineral exploitation (mineral rents). The current Royalty Act was to come into force by 2009, as all old mineral rights were to have been converted to new rights – properties of state – by then. In actual terms, it came into force in March 2010. The main purpose of the MPRRA was to impose and "collect royalties from South African mines holding mining rights in accordance to MPRDA, in order to compensate the State for its custodianship over her non-renewable mineral resources when these are mined and sold by mining companies for their own benefit" (Cawood, 2010). Unlike international practice, mineral royalties were not payments charged on production at mine mouth but on transfer of production i.e. first sale of production (not subsequent transactions). This first transfer or sale is "considered the initial disposal of beneficial ownership by an extractor".

The MPRRA stipulates an *ad valorem*, sliding-scale formula method of charging royalties. The sliding-scale formula mechanism imposes no specific rate for any minerals, through its definition of value acknowledges profitability and automatically recognizes downstream beneficiation of mineral products as it distinguishes between refined and unrefined minerals, amongst other things (Cawood and Minnitt, 2001). This implies that the royalty system also aligns with the government's objective to promote local beneficiation of South Africa's minerals (Portfolio Committee on Finance, 2008). 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. A refined mineral resource is as listed in Schedule1 of the MPRRA.

This dual formula royalty system has a lot of other advantages, some of which include provision of automatic relief for marginal mines, small mining business and

mines in development stage; allowance of the State to share in both the upside (windfall) and downside (risk) of the mining industry; as well as exemption for sampling. However, despite these advantages, a number of objections to its provisions exist especially as regards its beneficiation objectives. The general objection is that "the inclusion of beneficiation in the royalty formula may complicate matters without necessarily ensuring beneficiation and that the tax system is not necessarily the best way to achieve that" (Resource Investor, 2007). This informs the focus of this project.

## 1.3 JUSTIFICATION FOR STUDY

In light of the drive to ensure sustainable development from mineral development, the need has arisen for raw-mineral producing countries to evolve to downstream processing countries as well, so as to benefit from higher sales value received by value-added products. This has led to many countries reviewing or in the process of developing and incorporating initiatives that will encourage downstream sectorial development in their mining taxation policies. An example is South Africa via its MPRRA's provisions to incentivize refining activities over extraction activities. However, these policies need to be assessed to determine if desired success would be achieved or not. If assessment proves otherwise, it might suggest that the taxation policies should be re-addressed and re-formulated as separate from value-addition policies. This informs the justification for carrying out this research project.

The findings of this project will be presented for future consideration, as it is too early to reformulate the MPRRA, seeing that it just came into force in March 2010. Frequent changes in taxation policies of any jurisdiction, increases the perception of risk and instability, which has been observed to be deterrent to investment attractiveness (Otto et al, 2006).

## 1.4 AIMS AND OBJECTIVES OF THE PROJECT

Mineral commodities have unique characteristics that make them differ from other manufactured products. They require large capital first to discover them and ensure that the ores found are economic to exploit, then additional large capital is required to extract them. Added to the significant capital requirements is that the prices for raw materials are determined in world markets based on current demand for those minerals which is not as stable as demand for refined/finished product. These commodity prices ultimately determine the amount of returns on invested capital received for raw mineral exploitation, and invariably the amount of royalties that are chargeable.

This project would be specializing on the platinum industry. Through its application to this industry, this project seeks to assess whether the MPRRA's provision of reduced royalty rate for refined minerals as compared with that of unrefined minerals is not overcompensation. The findings of this research should indicate whether the MPRRA will not just encourage many more mining companies to become more profitable extractors but will also motivate them to become refiners or processors of minerals, thereby satisfying the South African government's beneficiation objectives as well as its economic objectives. In establishing the above, the following issues will be looked into:

- Considering the supply and demand pattern of both refined and unrefined minerals, in general, it can be assumed that the demand for refined products is usually higher than that of unrefined minerals but their supply pattern is the reverse. There are usually more available unrefined minerals than refined, which increases the price of refined minerals and lessens that of unrefined because of oversupply. It is therefore appears that if the supply and demand pattern for refined minerals follows this assumed behaviour, the lower royalty rate for refined minerals would always be advantageous. In this light, the

question arises as to whether beneficiated products are not over-compensated as compared with a higher royalty rate charged for unrefined minerals. However, this 'over-compensation' would only hold as being valid, if after considering the market demand, capital-intensive requirements (expertise, proprietary, infrastructural and equipment) for refined production, the refiner's financial position is significantly more valuable than that of the miner;

- Is it possible for the mining costs of a PGM operation to exceed its refining costs? If the former case is largely validated for any commodity, this would negate the justification for applying a lower royalty rate for beneficiation activities; and
- Does the royalty regime's reduced rate provision for refined minerals change the financial position of mining-only projects?

## 1.5 STRUCTURE OF REPORT

Chapter One Background, Literature review and aims of research

This chapter gives the introduction and general background knowledge to the subject matter of this report. Also, a review of past related research work, related country examples to the subject matter and the aim of the research would be discussed.

Chapter Two The South African Context Mineral Fiscal Policy Issues

In this chapter, lessons from the country examples mentioned in chapter one would be reviewed for comparison with the South African case. More importantly, in this chapter, the South African mineral policy framework and the development of its mineral fiscal instruments, specifically, the new royalty regime would be discussed quite extensively. The focus of this discussion would be in light of policy objectives to further motivate the establishment of value-addition facilities.

Chapter Three Methodology: Application of Bradley's (Western Australia) model to the South African context

This chapter would specify the methodology that would be used in this research project. The royalty system of Western Australia which incorporates beneficiation initiatives would be reviewed and analysed to check its success or not, in light of Bradley's study into the mineral revenues in Western Australia. His conclusions and recommendations in this regard would be applied to the South African mining industry, so as to check its effect on financial positions of Mining-only and Mining plus Refining projects.

Chapter Four Impact of MPRRA on the South African mining industry and its contribution to South African economy

This chapter would seek to assess the general effect of the imposition of the MPRRA on the South African mining industry and its contribution to the economy. The sub-sector that would be used as a suitable case study for the analysis required in order to answer the fundamental question of this project would also be identified in this chapter.

Chapter Five Results and Analysis of Platinum case study

The data from the case study would be integrated with the model given in chapter three and the results would be analysed. Also, the results obtained would be compared with the comments on the shortfalls of the new royalty regime, later on in this project. These should give an indication as to whether or not the effect of reduced royalty rate for refined minerals will prove to be favourable to mining company and industry in general and whether more extractive companies would be encouraged to add-on beneficiation activities and to make appropriate recommendations for the realization of the South African government's beneficiation objectives.

Chapter Six Conclusion and Recommendation

In this chapter, a summary of all the chapters, the findings of the research and the conclusion of the research findings would be stated. Based on the conclusion, recommendations for further work on the subject-matter, if any, would also be stated.

## 1.6 CONCLUSION

In summary, this chapter covered the history that governed the evolution of mining fiscal systems, the different types of mining taxation systems in existence with main emphasis on the use of mineral royalties to target economic rents for the compensation for state-owned resources and contribution to increased economic growth and development of mineral-rich jurisdictions. Also, the chapter highlighted the albeit pre-existing concept of using mining fiscal policies as development strategies that encourage mineral beneficiation. This would facilitate the moving away of mineral-rich jurisdictions from being primarily dependent on natural resources, along high-tech economic growth paths, to becoming knowledge-based industrialized countries, in order to ensure sustained and long-term growth and development of their jurisdictions.

With the country examples that were reviewed, it can be concluded that it has emerged as an indisputable principle that it is just and necessary for mineral-rich States, as owners of the minerals, to use mineral fiscal instruments (especially royalties) to target economic rents for compensation for the exploitation of their non-renewable scarce resources. It is also not unusual for these instruments to be used as strategies to promote further mineral processing within their jurisdictions, which in line with their industrialization objectives.

In chapter two, the new South African royalty system which seeks to use its fiscal policy capacity for both revenue-collection as well as encouragement of the

establishment of more refining facilities from extractive ones so as to further capitalize on the economic advantages of its mineral sector, will be discussed in more detail.

# CHAPTER TWO

# THE SOUTH AFRICAN CONTEXT: MINERAL FISCAL POLICY ISSUES

## 2.1 INTRODUCTION

The advantages and benefits of the existence of mining and mineral processing facilities within a country in terms of job creation; provision of opportunities for the development of domestic skills; encouragement of the creation of associated industries thereby boosting the manufacturing sector; and providing other beneficial side effects or linkages for the local economy (Tilton, 1992), cannot be overemphasized.

As highlighted in chapter one, it can be stated that the current emphasis on the use of fiscal instruments in order to encourage further mineral processing (refining) and beneficiation for the stimulation of industrial and economic growth and development of mineral-rich countries, South Africa inclusive, is not a new phenomenon. Apart from the country examples reviewed in chapter one, other countries like the U.S., Canada, Scandinavia, Indonesia, Chile, in recent decades also accomplished diversification of their country's exports away from natural resources and realization of economic growth, by using the development of industrial or high-technology sectors simultaneously with development of natural resource assets. Studies into the industrial strategies used by Sweden and Finland which made them evolve from primary resource-dependence into knowledge-based economies, point to the role of public policy in using natural resource abundance as a basis for economic growth and development in the era of globalization (Lederman and Maloney, 2007). The success of these resource-based industrial strategies required intelligent public policies and company strategies that preserved raw material resources, created the skills and competence needed to maintain competitiveness in the face of increasing labour costs and changing technologies as well as facilitated the creation of close inter-linkages of

various ‘upstream’ and ‘downstream’ industries and services around natural resources investment projects (Bravo-Ortega and De Gregorio, 2007).

It can also be drawn from these country examples that in addition to mineral occurrence, stable political, social, economic, legal and social conditions are important for mining investment decisions to be made by both local and foreign investors. These factors combine to enhance overall attractiveness of a country or region. For a long time, the Southern African region (South Africa inclusive) due to its deficiencies in the above-mentioned factors was characterized as being an unattractive investment jurisdiction, which resulted in the poor growth performance of its mining sector(s).

It was realized that the unattractiveness of the region could be attributed to the fact that many other mineral-rich developing regions and countries in Asia and South America, offered more favourable investment environments than its own. Many of these developing countries had made urgent revisions to their mineral policies in the past so as to attract the limited investment funds. With this, the member countries of the Southern African Development Community (SADC) decided to harmonize their policies, and carry out risk evaluation exercise of these factors as well as geological, technical, regulatory and fiscal elements, so as to change the unattractive positions of their jurisdictions. They compared their regional framework using these factors and parameters to the Competitive Investment Framework (CIF), which was derived from the performance of developing countries that had been categorized as being attractive to foreign investment. Knowing that mineral royalties are one of the major concerns of foreign investors, this was one of the parameters assessed against the CIF. As at 2004, a comparative was done and it was realized that the average royalty rate in SADC was about 6% which was rather high compared to the CIF rate of 1% (UNECA, 2004). This supported the view of the region’s investment unattractiveness and indicated the need for SADC countries to also revise their mineral policies.

As mentioned in the previous chapter, a mineral royalty is charged by the owner of a resource as compensation for depletion of the minerals that are mined and removed from the land (UNECA, 2004). Royalties are to be used for the benefit of the owner of natural resources and in this case, the State(s) is the sovereign owner and these royalty 'benefits' can only accrue to States if they do not distort investment decisions. Each mineral deposit is unique in terms of location, quality, quantity and type, and this specifies its value. On this basis, CIF and standard international practices require that different royalties are to be applied to different minerals based on their difference in value. This approach was recommended to the SADC for incorporation into its framework, and when considered with the need for mineral royalties to provide benefits in support of national objectives, this implied that some discretion is needed when deciding on the structure and rate of royalties (UNECA, 2004).

With the SADC region adopting the above recommendations and others realized from research made into the political, legal, fiscal aspects of the mineral policies of its member countries, this further contributed to South Africa's quest for a mineral policy framework that is acceptable to all the role-players in its minerals industry.

## 2.2 RESEARCH INTO THE SOUTH AFRICAN MINERAL AND MINING POLICY FRAMEWORK AND ITS OBJECTIVES

### 2.2.1 The Mineral Policy

Governments consider the minerals industry as a part of productive assets from which revenue can be collected to contribute to overall national development. The Mineral policy of the country outlines the national objectives that the country seeks to achieve from its mining sector, and it also stipulates among other things, the fiscal means by which revenue can be extracted from its mineral sector. Therefore, before investment is made into the mining sector of any country, it is important for the investor to assess

the laws and policy statements of its proposed investment destination in order to consider how the mineral policy of the country will impact on his returns and growth in shareholder value as it seeks to contribute successfully to the nation's objectives.

The Minerals and Mining Policy for South Africa was released in October 1998 by the Department of Mineral Resources (formerly known as the Department of Minerals and Energy). It formed part of South Africa's policy and institutional environment review process, which was needed to strengthen the mining industry to make it fit to address the problems and opportunities confronting it especially in the light of "increased competition, both in commodity markets and for investment from other mineral-rich countries that had liberalized their economic and political systems to attract investment" (Department of Minerals and Energy, 1998). Before its release, there had been reforms in other aspects legislative and regulatory systems such as health and safety, human resource development, labour and employment equity, environment, which set a proper stage for mineral policy review. The main themes of the policy were:

- "Business climate and mineral development, which looks at the continuation of policy conducive to investment and includes a section on mineral rights and prospecting information which presents changes to the system of access to, and mobility of, mineral rights;
- Participation in ownership and management, which examines racial and other imbalances in the industry;
- People Issues, which looks at health and safety, housing needs, migrant labour, industrial relations and downscaling;
- Environmental management;
- Regional co-operation; and
- Governance". (Department of Minerals and Energy, 1998)

The chapter on Business climate and mineral development addressed seven topics relevant to the climate for mining business and mineral development which include

issues like ownership of mineral rights; mineral fiscal instruments (including royalties) and allocations from national revenue; standard terms and conditions for all prospecting and mining permissions; mineral beneficiation; small-scale mining; and minerals marketing.

For the purpose of this report, the mineral beneficiation intent of this policy framework will be focused on. The general purpose of South Africa's mineral policy was and still is to develop South Africa's mineral wealth to its full potential and to the maximum benefit of the entire population. This implied that government would promote facilitation of not only primary extraction but the establishment of secondary and tertiary mineral-based industries aimed at adding maximum value to raw materials.

Mineral beneficiation can be broadly described as the successive processes of adding value to raw materials, from extraction through to the sale of finished products to consumers. It covers a wide range of very different activities such as large-scale and capital intensive operations like smelting, technologically-sophisticated refining as well as labour-intensive activities such as craft jewellery (Department of Minerals and Energy, 1998).

It is known that value-addition to mineral resources can result in a country realizing greater rent from exploitation of its natural resource base and it can serve as a good foundation for further industrial development. South Africa has been heavily dependent mainly on the primary extraction of its mineral resources. In the context of the need for competitive-advantage among other mineral-rich countries and the fact that the real prices of numerous minerals have been declining over the past four decades due to a combination of factors, which led to a general deterioration in the terms of trade for raw material exporting countries, South Africa decided to take advantage of her potential such as large mineral reserves and technological skills, in order to increase its proportion of mineral output through value-addition. Although,

for many decades, the mining industry had invested in mineral beneficiation projects, where there have been worthwhile opportunities, it was necessary to expand this sector so as to achieve policy objectives of realizing maximum benefits from mineral development. However, for the development of mineral beneficiation projects, economic and fiscal certainty is required for the long-term planning.

From the extensive consultation process carried out for the preparation of this policy framework, the combined view from the mining industry, investment analysts and other interest groups was that for government to promote mineral beneficiation, they should provide supply-side incentive measures which consider the risks inherent in large-scale mineral beneficiation projects and they should not be detrimental to the international competitiveness of the mining industry in respect of un-beneficiated mineral exports. They also opined that with regards to mining taxation policy, the tax system should encourage the adding of value to raw materials. The Government responded in the White paper on Minerals and Mining Policy by stating that efficient supply-side measures will be introduced such as lower royalty rates for projects that include beneficiation. However, in order for interested parties to qualify for such incentives, they would be required to present a commitment to promote further local downstream beneficiation through, inter alia, export parity pricing of goods.

In pursuit of promoting this sector, government stated that decisions regarding beneficiation projects based on sound economic and market principles would be monitored by the Department of Mineral Resources (DMR); policies and regulations that previously constrained the downstream development would be reviewed by the DMR and other departments and institutions involved; and greater cooperation and coordination would be established between the DMR and Department of Trade and Industry, as regards mineral beneficiation (Department of Minerals and Energy, 1998).

### 2.2.2 Brief Exposition on South Africa's Beneficiation Industrial Approach

As mentioned earlier, the value-added processing of minerals has carried on for many decades and represents a major industry and an important growth area in South Africa (Bureau of African Affairs, 2010).

In the past, it was sufficient for mineral-rich countries just to export raw natural resources for use by other mineral-poor countries. However, with advances in urbanization and industrialization, terms of trade of raw mineral exports as compared with manufactured goods, reduced. This resulted in reduction in purchasing power of mineral-rich countries, indicating that countries that are heavily dependent on only raw mineral exports are at a significant disadvantage in terms of economic growth and sustainability.

In the new trend, in order to improve the well-being of citizens and instigate transition from poor to rich economic status, exportation of value-added mineral commodities and downstream processing (beneficiation strategy) within mineral-rich countries such as South Africa has become the main emphasis in facilitating economic growth, development and sustainability.

In light of the attractive benefits of the industrial strategy of value-adding to natural resources, South Africa launched a Beneficiation Strategy in 2009. The government based on the intentions of the Mineral Policy 1998, through the DMR saw it as a favourable and worthy cause to be pursued due to its self-evident and logical potential of facilitating economic growth and transiting mineral-dependent countries into becoming knowledge-based and labour-intensive industrial giants.

With the increased demand for not only primary raw minerals but also resource-based consumer goods and services, against the backdrop of the general economic rule that beneficiated products attract higher prices due to their higher sales value as compared

to raw, unrefined products, more opportunities are being opened for South African minerals industry "to supply products with a significant local value-add" (Department of Minerals and Energy, 2009)

Traditionally, raw or near-raw minerals were exported to satisfy the demands of the industrialized economies, which have reaped the benefits of value-addition via both local and export sales of their products. Since beneficiated products are obtained from raw mineral resources, it is only fair for the custodian (South African government) to also reap additional economic benefits and compensation from this activity.

Despite criticisms, the South African government opines that companies involved in mineral development should also be involved in downstream minerals beneficiation. The government posits that mining companies adding on beneficiation processes would not be an inappropriate burden since primary mineral inputs which they provide serve to attract other tiers of the value-chain or industries that do not necessarily have any business with exploration, mining and extraction, but possess metallurgical and manufacturing skills and expertise that result in value-addition.

The South African government, through the DMR, seeks to motivate and encourage the establishment of more beneficiating (refining) companies by providing incentives like lowering royalty rates for projects that include beneficiation as value-addition adds to the costs of mineral development; export parity pricing; stability in cost of public services and goods; state support for research in beneficiation techniques; investing in providing expert training and equipment to small local entrepreneurs to encourage and expand local expertise and support local beneficiation; effective dissemination of non-confidential, State-held information; and programs to allow for the review of policies and regulations that constrain downstream development (Northern Cape Province, 2005), as stated in the Minerals and Mining Policy of 1998.

The provisions of the Mineral and Petroleum Resources Royalty Act (MPRRA) for reduced rate for refined minerals appears to be one of the ways to achieve this beneficiation objective of the government and the assessment of its success on delivering this objective, and this informs the focus of this project.

## 2.3 EVOLUTION OF SOUTH AFRICA'S CURRENT ROYALTY REGIME

In South Africa, from as far back as 1878, collection of mineral royalties had been used as an instrument of obtaining surplus revenues from mineral exploitation (mineral rents). In formulation of the current MPRR regime, some points were taken from recommendations of different of commissions of inquiry set up (in South Africa's mining history) to look into South Africa's mineral policy and mining investment policies. The detailed history of the different royalty systems and lease instruments applied to the gold mining industry that existed before that of the MPRRA was given by Scott (1979) and Cawood (1999). Cawood and Minnitt (2001) stated that the current royalty regime's formula-based design was facilitated mainly by the principles of the gold lease and Mr. I. J. Haarhoff's recommendations to the Frames Commission of Inquiry in 1917.

In 1917 and 1918, there existed a Frames Commission of Inquiry, to which amongst other things, a certain Mr. I. J. Haarhoff made some contributions which influenced the current royalty regime. For optimization (not maximizing) of government revenues, Haarhoff made some recommendations, which were that the state should claim royalties instead of state engaging in mining activities; that royalties should be charged on output, irrespective of the profits and it should be sliding-scale, more or less on the yield per ton. The sliding-scale concept of royalties implied by Haarhoff opined that it would reduce the mine risk and provide for equitable payment to the government at all times.

As at 1932, gold mines were subjected to payment of lease consideration. This concept was meant to be compensation to the State for the right to mine its minerals because initially only these rights (applicable only to precious stones and metals) were vested in the State in terms of mineral laws which was not inclusive of land ownership. The Union government at that time used a complex sliding-scale fiscal instrument to collect excess profits and additional tax revenues from gold mines. This formula provided for the adjustment of profits in such a way that it encouraged the mining of lower-grade ore "by increasing realized profits artificially and therefore, lower taxable excess profit" (Cawood, 1999). However, different mines had their own unique sliding-scale formulas for profit and lease consideration. In order to provide a permanent and consistent regime which would support mining of low-grade ore, the Corbett commission of 1936 was set up. This sliding-scale formula nature of the lease consideration constituted the cornerstone of the country's current royalty policy.

Although, there was the Holloway commission of 1946, whose recommendations aimed at optimizing balance between government receipts and company returns as it suggested that profit taxes were better than those that entered the cost equation because of their smaller impact on the pay-limit, it was the Margo Commission of 1987 that had more impact on the formulation of the current royalty policy. This commission was the first to mention mineral royalties (Severance tax). The commission assessed the likely success of the use of Severance tax as an alternative method of charging mineral royalties, stating that it should be a compensation to present and future generations for loss of their exhaustible resources but did not support the imposition of the tax. The commission also maintained the use of principles of the sliding-scale gold mining tax formula and recommended that the tax and mineral royalty formula be combined into one formula.

In 1991, a new Minerals Act No. 50 of 1991 was enacted and it did not reserve the right to mine any minerals to the state but allowed for disposal of state-owned mineral rights to private parties. By 1992, the introduction of this new Minerals Act

resulted in the repeal of the Precious stones Act No. 73 of 1964 and Mining Rights Act No. 20 of 1967 which supported the 'lease consideration' concept. Therefore, this led to cessation of lease formula payments, removal of automatic vesting in the State of the rights to mine precious stones and metals and cancellation of the State sharing in mining profits except for profits from State-owned mineral rights and from old order mineral rights. However, alongside these developments also arose the issue of royalty payment mineral rights owner by mining company. With the existence of multiple mineral ownership rights, this also resulted in availability of multiple royalty systems to mining investors in South Africa. Problems of inconsistency and unfairness arose as regards share of revenue benefits, because the outcome was skewed in favour of the party (mining company or State) that had the better negotiation skills, and in most cases, mining companies had the upper hand. As stated by Bradley (1986) that "…standardization and consistency are interrelated and both are desirable", this fragmented and inequitable situation had to be resolved. Apart from its mineral taxation system generating no substantial wealth for the government, it was also considered that its mineral development was largely unattractive to investments in terms of exploration and mining investments due to the poor performance of its nationalized mining sector (Cawood, 2010). This led to the review of South Africa's macroeconomic policies especially those affecting the mining industry.

Part of the reforms led to the release of the Minerals and Mining Policy for South Africa in October 1998 by the DMR. The White paper of the Mineral and Mining Policy addressed the various issues challenging the minerals industry in order to propose ways of tackling them so as to result in a minerals sector that maximally benefits the South African people. Amongst other things, the White paper with regards to mineral royalties, stipulates that irrespective of whether the mineral rights are State or privately-owned, royalties "will be determined by state officials after consultation with the registered holder of the mineral rights" (Cawood and Minnitt, 2001).

Furthermore, the government in response to the need for reform of fiscal policies (rent capturing instruments) conducted a comparative study against the CIF, in 1999. It reduced its corporate tax from 35% to 30% and considered the reduction of its STC- 12.5% on distributable earnings, after the realization of its high magnitude. The White paper on Mineral policy served as a basis for the enactment of the MPRDA 2002.

As mentioned earlier, one of the main objectives of the MPRDA was to vest all mineral right ownership in the State (which had been the intention of the government from the onset of its policy reforms) and that all South Africans must benefit from her vast mineral resources. According to the Minister of Finance (2008), "the benefits of our vast mineral resources, some of which are about to be depleted, has historically accrued to only a few". The MPRDA with its provision for State custodianship served as a sound basis for the further re-examination of which rent capturing systems (mining-specific) to choose. To ensure that the mining industry transcends to the benefit of larger sections of South Africans as required by the MPRDA, charging of mineral royalties was settled for.

From 2003 to November 2008 when the bill was enacted, four drafts of the Royalty bill were released and they underwent extensive consultations and debate amongst all relevant stakeholders. In 2003, the first draft of the new royalty bill was released for public comments. It was value-based with fixed rates as high as 8%. In the same year (2003), Cawood was asked by the National Treasury to make contributions as to choosing a suitable base. He submitted in accordance with UNECA study (2004) that Net Smelter Return (NSR) base, which is gross sales definition less allowable expenditures related to transportation, marketing and value-addition, was desirable, because a profit base would require rates to be higher compared to gross sales base. The second draft (2006) used fixed rates ranging from 0% to 5% of sales value, and made provisions for reduced royalty payments for refined metal products and marginal mines. The third draft (2007) was modified to a formula mechanism for

calculating the rate and was based on a NSR definition of income. The fourth and final draft (2008) was still by a formula "but only after classifying the mineral as either refined or unrefined", thereby justifying the legal text for NSR to include allowable deductions (Cawood, 2010). After the final draft, the Minister of Finance (2008) stated that "the South African MPRR Bill will make contributions towards greater transparency, sustainability and the distribution of benefits to all south Africans".

The Mineral and Petroleum Resources Royalty Act was finally promulgated in November 2008, after many debates and consultations over its provisions. The use of this royalty formula instrument only came into force from March 2010. As mentioned in the previous chapter, it stipulates dual *ad valorem*, sliding-scale formula method of charging royalties. This dual sliding-scale formula mechanism imposes no specific rate for any minerals, through its definition of value, acknowledges profitability and automatically recognizes downstream beneficiation of mineral products as it distinguishes between refined and unrefined minerals (Cawood and Minnitt, 2001). This implies that the royalty system also aligns with the government's objective to promote local beneficiation of South Africa's minerals (Portfolio Committee on Finance, 2008). 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. A refined mineral resource is as listed in Schedule1 of the MPRRA.

This formula royalty system has a lot of other advantages such as provision of automatic relief for marginal mines, small mining business and mines in development stage; allowance of the State to share in both the upside (windfall) and downside (risk) of the mining industry; exemption for sampling. In spite of this, a number of objections to its provisions exist especially as regards its beneficiation objectives. The general objection is that "the inclusion of beneficiation in the royalty formula may

complicate matters without necessarily ensuring beneficiation and that the tax system is not necessarily the best way to achieve that" (Resource Investor, 2007).

### 2.3.1 The design of the MPRR regime

In the current era of many expectations and markets of differentiated mineral products at various stages of beneficiation, in designing an optimal royalty regime that will accommodate this diversity and stand the test of time, flexibility is compulsory coupled with standardization and consistency, as recommended by Bradley (1986). This places onus on policy makers to consider many complex (often contradictory) issues in order to balance the satisfaction of both government and company objectives. Up to date, it seems that no perfect, universal best practice royalty exists (Cawood, 2010).

As with every regime, the structure of the MPRR comprises of royalty base, royalty rate and source. These are discussed below.

Royalty Base

The MPRRA's base is gross sales. According to the Act, 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.

Royalty rate

As mentioned earlier, the design of the formula-based royalty rate was facilitated mainly by the principles of the Gold lease and Mr. I. J. Haarhoff's recommendations to the Frames Commission of Inquiry in 1917. The gold lease formula was based on profitability (ability to pay). It had a minimum lease rate connected with a profit-based sliding-scale formula, to guarantee that some payment is guaranteed when

profits are not realized and to share in realization of high profits (Cawood, 2001). Haarhoff's recommendation did not supply the commission with a formula, however, he stated that the state must impose royalties instead of state involvement; a (minimum) royalty be levied on revenue but at the same time recognize profitability (making allowance for higher royalties in times of high profitability and vice versa). According to (Cawood, 2010), in combining both gold lease formula and Mr. Haarhoff's recommendations, the design of the MPRR formula yielded this:

Y% = minimum rate + allowance for higher royalties in times of high profitability = a + b

Where,

a = minimum rate

b = rent premium = $\frac{\text{X}-\text{Ratio in current year}}{\text{Factor to achieve the maximum rate}}$

a + b = maximum rate

b-factor provides for a profit sharing or sliding-scale mechanism between the minimum and maximum rates. More details of the design appear in Cawood (1999).

The rationale for the minimum rate also follows the opinion of Otto et al (2006) that a minimum royalty should be charged which ensures absolute minimum compensation "….for its exploited resources even when the operation was unprofitable". The choice of maximum rate was based on international best practice using CIF drawn from mineral royalty systems of top investor-friendly developing countries, which was not more than 3% on average.

Standard international practice requires that a royalty rate should acknowledge the amount of processing required for each mineral product, which would inform the charging of different royalties to different minerals based on their difference in value.

With each mineral product requiring its own unique rate, it would be onerous to use a fixed-royalty system to specify these rates as it would result in an extensive and comprehensive list of mineral products against royalty rates, which must also be frequently revised when new minerals become useful and others are replaced by new materials.

The MPRRA allows for classification of mineral resources as either refined or unrefined, which is stated in Schedule 1 and 2 of the Act. According to the MPRRA, the rate is determined by using the appropriate formula after the mineral classification. The structure for determination of the royalty rate is in line with the above-mentioned standard international requirements for an appropriate royalty regime and it erases the need to have extensive lists for each mineral product based on their different stages of beneficiation, as its calculation works by varying the rate with profitability of the mines for each mineral product transferred. The rate is reduced as beneficiation increases so as to compensate for the higher sales value due to higher prices received for refined products. The rates for refined and unrefined minerals are calculated thus:

Refined rate $Y\% = 0.5 + \left(\frac{\text{EBIT}}{\text{Aggregate gross sales x } 12.5}\right) \text{ x } 100$

OR $Y\% = 0.5 + \left(\frac{X}{12.5}\right)$; and

Unrefined rate $Y\% = 0.5 + \left(\frac{\text{EBIT}}{\text{Aggregate gross sales x } 9}\right) \text{ x } 100$

OR $Y\% = 0.5 + \left(\frac{X}{9}\right)$

Based on structure of Y% = (a + b),

Where,

- a = acceptable 1% minimum rate (based on precedents);

- $b = \frac{X}{F}$;
- X = profitability indicator i.e. $\left(\frac{\text{EBIT}}{\text{Aggregate gross sales}}\right)$ x 100;
- F (Factor) = 12.5 and 9.0, which determine maximum rates for refined and unrefined minerals respectively;
- EBIT = Gross sales after adding recoupments under Income tax Act 1962 less capital expenditure less operating expenditure ≈ net profit before tax definitions. However, EBIT is only earnings attributable to winning and recovery of mineral resources up to its saleable state;
- Aggregate gross sales = Arm's-length gross sales value; and
- a + b = maximum rate of 3% initially, but stretched to 5% (refined minerals) and 7% (unrefined minerals), in the SA case.

As at 2001, Cawood (2001) suggested that in order to successfully promote strategy for downstream beneficiation of minerals, the state may forfeit its share (b-factor in the formula) so as to receive on 1% royalty payment but this became unnecessary with the introduction of the provision for separate b-factors unrefined and refined minerals.

### 2.3.2 Beneficiation criteria

Based on evaluations made by Cawood (1999) and Netshipale (2008) against issues like equitable share of benefits between State and companies; response to changing economic cycles; alliance with global competitive trends and State Mineral policy objectives of stable revenue generation, the integrity and feasibility of MPRRA was acknowledged as a worthy piece of legislature. However, in light of mineral beneficiation policy objectives, further research was necessary.

As observed, the MPRR regime was designed with taking cognizance of the fact that mineral beneficiation projects share same risks with primary extraction in terms of

the uniqueness characteristics of the mineral resource, high capital commitment, long lead times, geological uncertainty etc. and any appropriate fiscal instruments for this aspect must take the above into consideration (Department of Minerals and Energy, 1998).

The MPRR sliding-scale formula nature, through its definition of revenue and separate mechanism which can be applied to profitability arising from sale at any stage of mineral production, automatically caters for downstream beneficiation of mineral products, which seems to imply that the regime also meets the beneficiation criteria. In a later chapter, this would be quantitatively analysed.

## 2.4 CONCLUSION

According to studies by Standish (1992); Davis (1994); Fine and Rustomjee (1996); and Hirsh and Hanival (1998), since the early 1920s, resource-based investment projects have featured prominently in the South Africa's industrial and economic policies, contributing significantly to her Gross National Product as well as providing capital for re-investment and further economic development. In light of this, South Africa's current drive to use its mineral royalty instruments to promote processing (refining) and beneficiation of natural is not a new phenomenon. In summary, this chapter explored and reviewed South Africa's mineral policy in light of mineral beneficiation objectives, the evolution of the current mineral royalty regime (as specified by the MPRRA), the structure and design of the regime as regards reduced royalty rate for refined minerals in order to encourage more miners to establish refining facilities.

Therefore, with reference to the country examples previously-mentioned, it can be concluded that SADC countries' and in particular South Africa's use of fiscal policy

instruments to further motivate the establishment of value-addition facilities, is not inappropriate.

Chapter three, which specifies the methodology to be used in this research project, takes an in-depth look into the mining royalty system with mineral processing provisions used by one of the country examples given in chapter one. The approach, lessons, successes or failures achieved by this country's royalty system in incentivising the establishment of more beneficiation facilities would be compared with and applied to the mineral processing incentives of South Africa's MPRRA, to ascertain if the royalty policy objective of encouraging miners to become refiners would be achieved.

# CHAPTER THREE

# METHODOLOGY: APPLICATION OF BRADLEY'S (WESTERN AUSTRALIA) MODEL TO THE SOUTH AFRICAN CONTEXT

## 3.1 INTRODUCTION

There are two parties – State and industry (developer or producer) – involved in the transfer of mineral rights, and a royalty system must be put in place in which financial arrangements are acceptable to both. If they are not acceptable to industry, the result will be a lack of growth in the mining sector, and invariably economic loss to the State. Industry cannot pay royalties where operations do not yield net returns, including a return on developers' capital and a return to developers commensurate with the risks they bear. This chapter seeks to assess a country's royalty system having beneficiation incentives in light of its encouragement or not of private sector investment in mineral processing ventures, so as to foster the realization of an industrialized economy.

In chapter one, a few examples of countries that have custodianship of their minerals and use *ad valorem* and/or hybrid royalty systems with beneficiating incentives were discussed. The aim of these examples was primarily to give an overview of whether their *ad valorem* royalty systems possessed any provisions to encourage beneficiation and to check if South Africa's royalty regime can draw any lessons from the success or not of their 'beneficiation incentive' provisions, if any. As stated in that chapter, the constraint of that section (Section 1.2.3), was the lack of access to up-to-date detailed information on the royalty regimes of many countries especially as regards provisions to facilitate beneficiation (mineral processing and refining), the analysis of the regimes and what the impact of regimes have been on investment and operation decisions.

In chapter two, other country examples with success in using fiscal instruments with beneficiation provisions were mentioned (although detailed information could not be obtained), which seem to indicate that the current emphasis on processing (refining) and beneficiation of natural resources to stimulate economic growth and development (within South Africa) is not a new phenomenon. As stated in that chapter, countries like the U.S., Canada, Scandinavia, Indonesia, Chile, Sweden and Finland, used public policy to instigate industrial strategies which made use of natural resource abundance as a basis for economic growth and development in the era of globalization (Lederman and Maloney, 2007), by fostering the development of industrial or high-technology sectors simultaneously with development of natural resource assets. By this, these countries were able to diversify their exports away from natural resources so as to realize economic growth as well as evolve from primary resource-dependency to becoming knowledge-based economies.

In this chapter, for the purpose of assessing the beneficiation provisions of the royalty regimes of the countries mentioned earlier, in order to apply to the South African context for the assessment of whether the current South Africa's royalty system's beneficiation incentive provisions would yield its desired success, the Western Australian's royalty regime example was chosen.

The methodology used in this research would be based on Bradley's Inquiry into the Mineral revenues in Western Australia (WA). His study would be reviewed and his recommendations as regards mineral processing would be applied to the South African platinum industry, to check its effect in terms of value-added to the financial positions of Mining-only and Mining plus Refining projects.

## 3.2 EXPOUNDING ON THE WESTERN AUSTRALIAN'S ROYALTY SYSTEM IN LIGHT OF BRADLEY'S WORK AS REGARDS MINERAL PROCESSING PROVISIONS

The Western Australian country example was chosen because of the similarity of its dependence on strategic commodities just like South Africa such as gold and coal, coupled with the fact that its royalty regime has provisions for further processing of minerals.

In WA, the mining and petroleum industries are said to contribute to the economy to the extent that the value they generate exceeds the production costs they incur. For instance, around the turn of the 20$^{th}$ century, the gold industry in WA grew rapidly in importance and growth, causing the industry to provide the major source of stimulus for its economy in the period before 1920. It is therefore appropriate to regard the extra output obtained by employing capital in mining, compared with its alternative use, as a contribution of the mining and petroleum industries.

As mentioned in chapter one, mineral royalties in WA have represented one of the primary instruments used to extract the industry's contribution to the economy and were and are still claimed based on its ownership of mineral resources. In WA, the objective of royalty policy is stated in very general terms, that the development of its mineral resources must result in maximal benefits to the people of WA, in the long term. The State bears the responsibility for ensuring that resources are well-developed so that maximum value will be realized for its citizens, therefore, it expects a return as compensation when rights to exploit the resources are transferred to developers. The potential magnitude of this return expected by the State from its resources depends on the value of the resources. Value can only be appropriated and extracted from mineral resources if only they are viewed as capital assets.

Royalties were collected initially under either the Mining Act of 1978 or alternatively, Agreement Acts that were negotiated for individual projects. After this, royalties became payable either under the Mining Regulations of 1981 or various State Agreement Acts. This system took into account price fluctuations and grade of material. The different rates were also intended to adjust for the change in the value as mined ore is processed and value is added (Department of Mines and Petroleum, 2011).

From 1981 to date, the mineral royalty regime has been reviewed at various times. These reviews were carried out so as to evaluate the existing system of mineral revenue collection in order to prescribe changes that were needed to be made for the State to realize more value from its resources. One of the main reviews whose study and recommendations apply to the objective of this research study is the Mineral Revenues Inquiry headed by Bradley, in 1986.

In this section, the expounded review of the WA system in light of its mineral processing provisions relies largely on the Bradley (1986) Report of the Mineral Revenue study carried out. The main aim of this review was to "appraise the existing system (as at 1986) of determining and collecting mineral resource (including petroleum) revenues and to evaluate and recommend alternative methods if appropriate and the appropriate rates or level of charges to maximize the benefits to WA from a vigorous mineral resources industry". The study looked extensively at understanding and explaining the arrangements of that time affecting the WA mining industry and dealt quite extensively with the further processing of minerals in the State, which the government had also consistently sought after.

According to Bradley (1986), the mining industry contributes to the economy through the realization of Net resource value and therefore, royalty systems should link royalties to this value. This would enable the State to share more equitably in the value of its resources over all operations and under varying economic conditions.

Contributions which can be attributed to net resource value include but not limited to royalties, certain infrastructure provision, additional mineral processing arising as a condition of resource tenure. However, before royalty instruments are designed for extraction of mineral wealth, it is important for the State to consider the nature of resource value. In valuation of mineral resources, its net value at any point in the production process is given by the difference between the future revenues which are expected when the reserves are recovered and the further costs that must be incurred to achieve its recovery.

Valuation of mineral and petroleum resources can be made in three different stages of mineral recovery – exploration, development and production. Emphasis on any stage of the project is a reminder that the developers have already invested funds to bring the project to this point. However, not to go beyond the focal point of this section of reviewing Bradley's work, the production stage – mineral processing stage – would be concentrated on.

In practice, royalty systems do not seek nor would be able to entirely appropriate net resource value because the State relies on private mining companies to develop its mineral resources. Therefore, it should take into consideration the additional expenditure that private developers incur in exploration, development and production, in order for the mining industry's long-term growth to be sustained. If the mining industry is non-existent because of lack of economic success of its projects, no value can accrue to the State.

Furthermore, royalties being based on net resource value are in concept inherently variable, because values of mineral products are based on price information generated by market transactions, which are commonly cyclical. This implies that realized value will be significantly different across time-periods, socio-economic, regulatory conditions. Therefore, net resource value should represent the maximum limit to which the State can claim PV of income from mining projects and it should be

specified with reference to the current situation at the time the State makes a mineral title available, in order to reward private companies for finding the minerals.

The results of any State royalty system will be observable from the bottom line on company profit statements or the revenue accounts in the State's books. In establishing royalty policy, it should be noted that its acceptability lies in the fact that it does not contribute toward reducing realized resource values from their potential level, which would lead to distortion of investment decisions or operating plans, and thereby negatively impact both State and private developers.

Capital investment itself, which is an input, represents a cost to the mining industry and to the economy; therefore, the significance of the net value of reserves can be appreciated by considering the other options available to the holder of the resource rights. If expected revenue does exceed expected processing cost, it will pay to proceed with proposed mineral processing plan.

As at the time of assessment in 1986, WA's customary royalty system relied on Gross value royalties (GVR) with several rates set in relation to the degree to which product is processed. GVRs used in WA were calculated in a variety of ways. The first is known as specific or unit based royalties and defined as dollars per unit of product. The latter is *ad valorem*, defined as a percentage of revenue. In the case of the first type, the resource owner receives either a share of mineral recovered and in the *ad valorem* type, receives a share of revenue realized from the sale of the mineral. The *ad valorem* royalty which claims a percentage of gross revenue has been the favoured instrument in WA.

A GVR is a conditional revenue generator for the State because it is not collected unless production takes place (specific royalty) or unless the product is sold (*ad valorem* royalty) but less conditional than profit-related net value royalties. GVRs represent a more certain return to the State than from a net value royalty. Coupled

with the near certainty of revenue collection they provide, they also provide relative revenue stability and are relatively easy to administer. The advantage of easy administration can be overstated for *ad valorem* royalties as it makes allowance for the value added by processing, which can make calculations complicated.

However, in the opinion of Bradley's study, it is stated that this system will yield economic waste unless royalties are held to nominal values because when levied at other than negligible rates they distort investment and production decisions. They recommended that a system which combines a 'basic royalty' with a 'net value royalty' should be put in place, which would meet the criteria of avoiding economic waste and achieving equity among different projects. In this system, the basic royalty would be levied on revenue from the sale of recovered minerals after deduction of certain allowed operation costs. The net value royalty would be levied on a base which corresponds as closely as is practical to the net realised value of the recovered mineral.

In spite of revenue generation from customary cash royalties, the government of WA sought to receive additional benefits because of the priority it placed on future regional development or industrialization based on further processing. The government held that if industrial development was to occur, some key processing industries had to established first, perhaps by state initiative. On this belief, the State set up the Wundowie charcoal iron industry in the 1940s, which failed to provide the thrust needed to realize this industrialization vision and this industry only continued in operation with large subsidies. The State learnt from this unfortunate experience and no further attempts were made using government ownership as a vehicle of industrialization-drive. However, some form of government direction was still necessary for this vision to be achieved but it moved on to allow market forces to work towards this goal, which resulted in only limited processing of primary products and little industrial development.

These failed attempts led to another direction whereby they decided to look at using public (fiscal) policy to induce the industrialization goal. They began to look at departing from the principles that underlie the standardized structure of cash royalty payments by making claims on resource value which differed from explicit money payment forms. This type of fiscal instrument was referred to as De facto royalties. This instrument required developers to make infrastructural provisions which others may use in the process of regional settlement; and/or further processing of minerals that would not otherwise be undertaken in the state.

The justification of the use of De facto royalties laid in the fact that they could provide significant benefits that could not be obtained within a standardized system, especially when they displaced customary cash royalties. In WA, De facto royalties involving processing commitments received a good deal of attention. The defence of these processing agreements, which seemed to appear to provide many benefits, was founded on the observation from the success of other countries that pressured multinational companies to process within their boundaries. Benefits promised by mining and mineral processing include job creation, provision of opportunities for the development of domestic technical skills when advanced technology is involved; encouragement of the creation of associated industries thereby boosting the manufacturing sector; and provide other beneficial side effects or linkages for the local economy (Tilton, 1992).

Although the state generally sought to maintain a consistent royalty policy with respect to customary cash royalties (GVRs), where de facto royalties were thought to be sufficiently important especially when it was felt that net resource value is high and that the customary royalties would not secure a fair share for the state, it became willing to make exceptions. The government began to call for many mining agreements to contain provisions for additional processing if, or when, it becomes economically viable. Consequently, the state thought to offset their claim on net resource value by providing incentives for the establishment of additional processing

facilities through the introduction of reduced royalty levies, else the net returns to the developer would be reduced. Alternatively, the State provided that failure to undertake additional processing was penalized by a royalty increase.

The State's willingness to sacrifice royalty income is an indication of the value it attached to further processing of minerals. The relinquishment of the State's royalty income in order to induce commitments to further processing meant that it would be trading a share of its claim to net resource value for the other benefits it expects to receive because the greater the de facto royalty required by the state, the more the royalty rate reduction (in order to gain commitment to further processing), thereby altering the share of net resource value between the state and the developer and reducing its portion of net resource value but total net resource value is unchanged.

With mineral royalties being allowed in the State to be collected either under the Mining Act of 1981 or Agreement Acts (negotiated for individual projects), these negotiated agreements (Acts) raised the possibility that the State would seek other benefits – additional mineral processing- from mineral development. Hence, De facto royalties in WA became intimately tied to the system of ratified agreements between developers and the State. These obligations to undertake processing became peculiar to each project as specific terms under which resource rights will be transferred were negotiated between state and developers on a case by case basis, thereby representing a departure from the consistent cash royalty system.

More so, these obligations for additional processing imposed additional costs to the developer, which had to be deducted in computation of net resource value. It may have been more costly to carry out additional processing in WA, thereby reducing the net resource value by added increment of processing cost and giving the developer reason to do it elsewhere. This led to the State's royalty incentive for undertaking additional processing in the State. By responding to a royalty incentive,

notwithstanding the higher processing cost, the developer might still be able to benefit significantly from this investment decision.

In WA, major resource development projects with processing requirements as at that time were contingent upon agreements negotiated between the developer and the State, for example, Iron ore (Mount Newman) Agreement, Diamond Ashton Joint venture Agreement Act and BHP Agreement. Here, another important aspect of agreements was examined in light of their use by the State (based on its resource ownership) as a mechanism for promoting economic growth and industrial development. To achieve this, the royalty claims on these agreements which had de facto royalty requirements, were GVR-based but contained provisions like reduced royalty rates per level of mineral processing. They were discretionary rather than standardized and therefore required a 'roll your own' approach.

Inclusive in the charge given to the inquiry carried out by Bradley's team of examining alternative royalty systems and making recommendations in light of the circumstances prevailing in WA, was that the Study evaluates the performance of royalty systems with respect to economic efficiency. Economic efficiency can be equated with neutrality. Thus, the more a royalty system causes developers to change investment or operating decisions to that which would not maximize the total value of resources to the economy, the less efficient is the royalty system. An ideal system should be one that conceives of royalty arrangements which would not distort developers' decisions at all. According to the report, the rationale for economic efficiency is that if a project would be undertaken in the absence of any royalty, it would still be undertaken, using exactly the same development plan, if a perfectly efficient royalty system was put in place. As regards further mineral processing requirements, this study therefore sought to assess whether the developer would be better or worse off than in the initial situation- without processing requirements- and by what amount, if any, that the developer will benefit if it takes up further mineral

processing in light of the state's grant of a royalty concession in exchange for processing.

The economic efficiency of any royalty system is a non-issue if the resource owner is content with gaining only a negligible share of net resource value, but when the owner seeks a greater share of net resource value, the efficiency of the type of royalty used becomes important. As stated by Bradley (1986), this is amplified by the objective of WA royalty policy of ensuring "economic growth through growth in the mineral industry in the long term interests of our State", which brings important set of issues to the fore – "what features must a royalty system possess if it is to encourage growth of the mining industry while at the same time fulfilling its function of providing the State with an acceptable return for the mineral rights which have been transferred to private developers?". Although the ideal of a perfectly efficient or non-distorting royalty is unattainable, the efficiency criterion must be given a high priority when choosing among alternative royalty systems.

Royalty paid depends on the combination of rate and base, hence, the good performance of any type of royalty performs with respect to maintaining economic efficiency is contingent upon this feature-combination. The royalty base of WA's GVR system is quantity of output or value of output and output is only maintained so long as a mining operation remains economically viable. Its royalty base diverges from net resource value because it takes no account of the cost of mining or of processing to the stage where royalty is assessed, which implies that royalty would be higher when more processing is done before the point of assessment. Thus, the possibility exists that incremental royalty charges can approach and even exceed the incremental value of product. When this happens, the efficiency criterion is violated, and the royalty system inflicts measurable damage upon the industry. Serious efficiency effects are realized in instances where an entire project becomes uneconomic with the imposition of a royalty or where the royalty causes production to be altered in a significant manner. When the result is that an entire operation is

threatened or major changes are made in production plans, the cost to the economy becomes highly visible in that not only will company's net returns and State royalties decline from previous expectations, but there will also be a loss of employment and possibly a significant decline in regional growth prospects.

### 3.2.1 The Mineral Processing Provisions of the WA Royalty System

As mentioned earlier, mineral revenues in WA are derived chiefly from *ad valorem* royalties. However, the system represented a departure from using a single *ad valorem* rate but several rates were applied depending upon the level of processing which was deemed to have been completed because of the fact that different minerals receive different amounts of processing before product value can be established through arm's length sale. With each stage of processing the value of the product is enhanced by varying amounts. In concept, the base for the *ad valorem* royalties was on minehead (also known as ex-mine) value, although minerals are rarely sold at the minehead.

The fixing of the ex-mine value as the *ad valorem* royalty base and scheduling of royalty rates according to level of processing was supported by the statement made by the Minister for Mines (1981), "…the examination of royalties set by iron ore and other development agreements indicated that a return to the State amounting to in the order of 10% of the value of production ex-mine offered a basis for a consistent and logical approach to the setting of royalty levels. Royalties would be applied to minerals in the form in which they are generally sold which, depending on the nature of the mineral, may be as a bulk material subjected to limited treatment; or as a mineral concentrate; or in a metallic, highly processed or finished product form. Royalties should be set for each particular mineral to apply across the industry, rather than on a mine-to-mine basis".

If a single rate is applied at the point of first sale, then the greater the amount of processing, the higher the royalty collected. This implies that processing would be penalized and royalty appropriates a larger share of minehead value than was intended. Also, the amount of processing varies among minerals and between mines producing the same mineral. Therefore, obtaining a uniform share of minehead value across sectors of mining and across individual mines which was the objective of the State, presented a problem. Furthermore, with reference to a standard of share of minehead value, an *ad valorem* system with a single rate was considered as being extremely inequitable.

Two methods were used for standardising royalty rates on a minehead basis so as to ensure that further mineral processing was not penalised, with increased royalty payments as processing increased. One method was based on netback calculation, where the arm's length price and processing cost information were used to deduce minehead value of a commodity. The rationale of the netback calculation was that the value added to the mineral processing is equal to the costs incurred, which are inclusive of a return on all invested capital. Minehead value is therefore, the residual calculated by subtracting processing costs from the value established at point of sale. The alternative method was to specify a schedule of rates corresponding to different levels of processing, with the rates becoming progressively lower as the royalty base (product value) is increased by further processing. The constraint of this method, however, was that only a limited number of broad processing categories could be specified and mining operations would be classified without analysis of their particular processing costs, thus, it would only be possible to account in a very rough way for the value added by various processing operations. The rationale for the scheduling of rates was that the rate applied to the value of any product should be reduced so as to compensate for the value added to that product by processing. Eventually, the schedule was based on the same net back calculations as used in the alternative approach.

In WA, most metallic mineral royalties were assessed on the value realized when the products were sold with the rates being specified according to the category of processing deemed to have been completed. The guiding concept of this royalty system is that royalty rates are to be set with reference to the schedule shown in the Table below:

Table 3.2-1: Principles of Western Australian *ad valorem* Royalty System

| | Value | Royalty Rate | Unit Cost (Value Added) by stage | Postulated unit value[2] | Implied Unit cost[3] |
|---|---|---|---|---|---|
| In Situ | $V_0$ | | | | |
| | | | $C_1$ | | |
| Ex-Mine | $V_1$ | 0.10 | | $¼V_4$ | |
| | | | $C_2$ | | $^1/_{12}V_4$ |
| C&S[1] | $V_2$ | 0.075 | | $⅓V_4$ | |
| | | | $C_3$ | | $⅙V_4$ |
| Concentrate | $V_3$ | 0.050 | | $½V_4$ | |
| | | | $C_4$ | | $½V_4$ |
| Metal | $V_4$ | 0.025 | | $V_4$ | |

Source: Bradley (1986)

Where,

1 = Crushed and screened natural product;

2 = The value by stage of processing such that royalty collection is invariant with respect to stage of processing expressed as a share of final product value;

3 = cost (or value added) by stage of processing required to yield postulated value, expressed as a share of final product value;

$V_i$ = Unit value of mineral or mineral product according to the stage of processing;

$V_4$ = Unit value of material which has passed through the refining stage. In principle, refined product is subject to a 2.5% *ad valorem* royalty;

$C_i$ = Unit cost of each stage of processing ≈ the value added, thus, $C_1$ is the unit cost of mining.

As indicated in Table 3.2-1, royalty rates slide downscale with successive stages of downstream processing to compensate for the increase in value of the product. The objective was to approximate the royalties that would be collected if a standard rate was applied to ex-mine value for all commodities. However, this objective could only be achieved with the royalty rates shown only when for any final product price the set of processing costs followed the unique pattern stated in the table and hence a unique set of product values by the stage of processing.

### 3.2.2 Analysis from the Developer's point of view

Based on evaluations carried out by the Inquiry using the schedule of rates above, variations in value added to financial position of projects or operations through downstream processing were assessed between operations within a particular branch of mining as well as between different branches of mining, based on processing costs and product value (price).

In the study, the effect of royalty system was applied to two different greenfields projects within the same industry having different processing costs – first producer with lower processing costs, second producer with higher processing costs. With assessment, it was observed that the royalty per unit of final product would be the same for each producer but this amount would never represent the same share of ex-mine value for two operations. The lower cost producer would have more value added to his returns than the higher cost producer.

The effect of this royalty system was also applied to plausible greenfields nickel and bauxite-alumina operations. Applying to the nickel operation, it was seen that for values of the level that would be required to justify a new venture, the royalty calculated at 2.5% of metal value would be less but not greatly less, than that calculated at 10% of minehead value, because of the low processing costs. For alumina, values in the range needed to justify a new venture, the royalty calculated as 2.5% of alumina value would be more, but not greatly more, than that calculated as 10% of ex-mine bauxite value due to higher processing costs. Also, applying this evaluation to the iron ore industry, it appeared that the iron ore industry paid a significantly higher royalty per unit of final product than it would if royalty was assessed as 10% of minehead value.

Not only does processing cost affect the decision to add-on processing facilities, price also plays a key role in whether a royalty rate of a given royalty system will cause serious distortions or not. Prices for mineral commodities are very difficult to predict, particularly in the long term and not determinable in most cases by the State or developers. Since price is not in the control of State and developer, in order for a royalty instrument that demands processing commitments, but also offers reduced royalty rate incentives to be efficient, control should be focused on either the rates applicable or the amount of processing costs incurred. At any given time, the corresponding share of net resource value depends on each operation's mining and processing costs so as price falls, the State's share of resource value represented by 10% of minehead value continually increases, thereby reducing that which accrues to the developer. For the evaluation carried out on the two projects within the same industry, given cost information of these projects and the royalty system's schedule of rates, it appeared that the projects would not proceed unless expected prices supported benefit-cost ratios in the range of 1.1, 1.3 and 1.5. These results showed that if the existing system were applied as envisaged in principle, it would indeed distort the developer's investment decisions.

Additionally, with analysis carried out by the Inquiry of several real-time case studies, it became apparent that with the royalty system's provisions for price and processing costs, some sectors of the industry felt that they were bearing a disproportionate share of the royalty burden, thus, each mining operation required specific adjustments, emphasizing the limitations of the system. In order for equity and non-distortion to investment decisions to occur, these limitations further necessitated the review process, so that the royalty system would take into consideration downturn in economic conditions and price volatility characteristics of the mining industry which when they occur, generate special pleading for royalty relief from existing mines that are on the margin of profitability.

The study also observed that the costs associated with a secondary processing operation are significantly increased when that operation happens to include a transportation component, although, it was the nature of (WA) GVRs that no allowance was made for the cost of recovery and delivery of different minerals for processing. This had to be addressed so that new royalty procedures would possibly make approximate allowance for transportation costs as well as differing processing costs. This again was supported by the Minister for Mines (1981) saying that "…the actual level of royalty set for a particular mineral had and would need to continue to take into account factors such as nature of the mining operation, difficulty of separation of mineral from the ore, profitability, remoteness of the mines, contributions to infrastructure, etc."

Nevertheless, in evaluating the WA royalty system existent at the time, it was in Bradley's opinion that since the State was conveying to the developer title to resources in the ground, the royalty base should relate to the value of the resources in the ground. He held that since the developer's mining operation adds value to these resources just as do subsequent processing operations, therefore, value added through mining should not be part of the royalty base but the transportation component could be deducted.

### 3.2.3 Conclusion of Bradley's study

In summary, the evaluation of the WA system showed that in light of the State's objective of equity in share of net value claimable across all minerals and mines, the inherent limitations of this system were evident. This was indicated in that when a standard set of royalty rates (scaled according to degree of downstream processing) was applied, there were substantial variations in the effective gross royalty at the minehead especially when the processing costs and prices differ from the unique set of relationships shown in the table above. The system could only yield this uniform return, under very special circumstances. Also in light of this schedule of rates, with variations in value added for projects of different minerals depending on differences in the market value of the products, it was observed that nickel and base metal projects, for example, would not go ahead if prices were at low levels, since they could not generate enough net income to pay the royalty. Even at medium price levels, the share of net resource value claimed by royalty might be enough to discourage such projects.

Therefore, according to Bradley's study, from the producer's perspective, if price is typically higher than the unique value implied in the table, but processing costs and royalty rates remain as in the table, there would be some significant value-add and it will be to the developer's advantage to have the downstream royalty assessment. If price is typically lower, the reverse will be true. Furthermore, if processing costs vary from those prescribed in the schedule, the reduced royalty rate for processed minerals would be a disincentive. The crux of the matter was not that some value might not be added to the profitability of these operations with adding-on mineral processing facilities but that whether the amount of value added was significant enough for such investment decision to be taken.

## 3.3 APPLYING BRADLEY'S WORK TO THE SOUTH AFRICAN CONTEXT

The application of Bradley's model to South Africa is for the purpose of carrying out a similar economic analysis (done by Bradley's team as stated in the previous section) for comparing the value addition costs with the difference in royalty amount when the lower royalty rate for refined minerals is applied to the larger base due to a higher price.

This section which aims at applying Bradley's work on the WA royalty system to the MPRRA, borrows from the model drawn up by Cawood (2011) which is based on his interpretation of Bradley's approach.

As stated in Table 3.2-1 in the previous section, the WA royalty system on which Bradley's approach is based specifies that royalty rates are scaled downward with successive stages of processing until the refined stage is achieved and gives the cost required per stage of processing required to bring each material to the specified share of final refined product.

In the Figure 3.3-1 below, the study carried out by Bradley is depicted. It shows the situation where royalties are assessed at the unit value (or unit prices) for refined stage and at ex-mine (unrefined) stage with a low royalty rate for refined minerals being charged at 2.5% and a high rate of 10% being charged to ex-mine value.

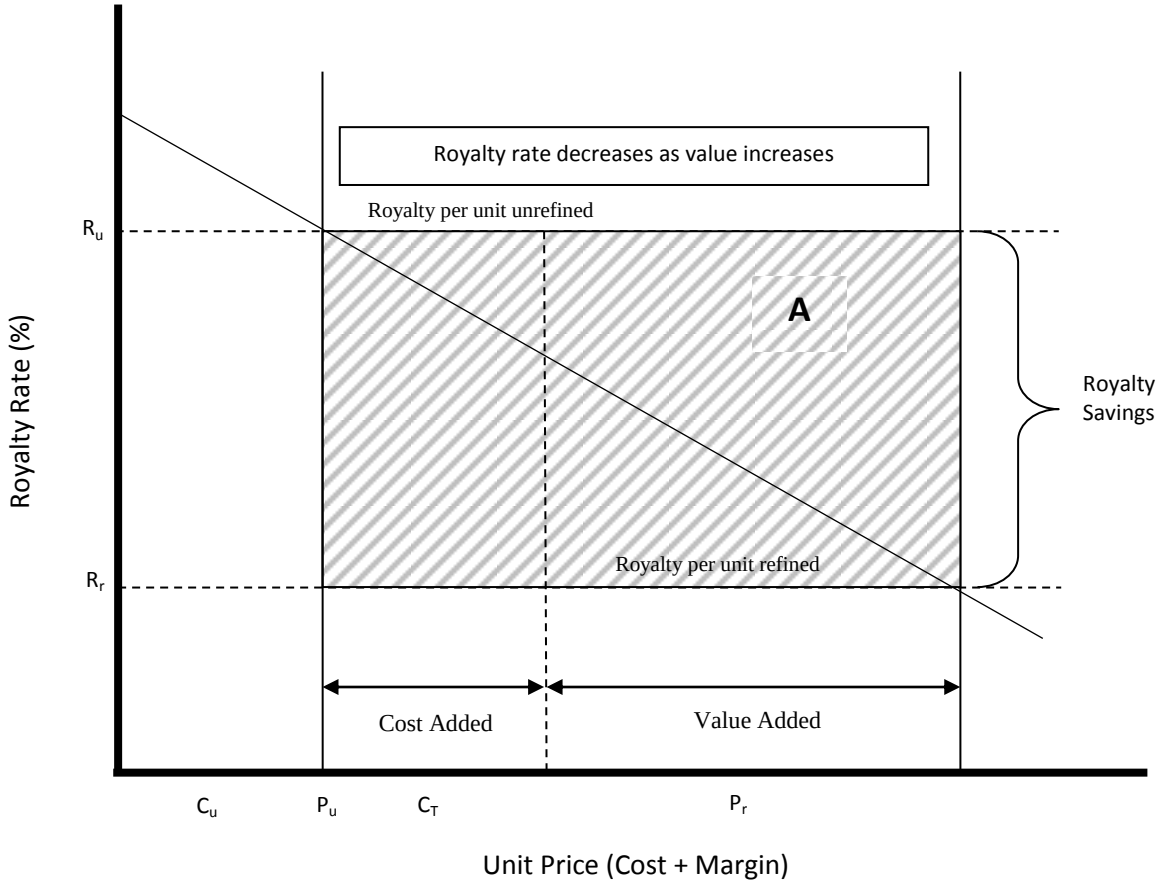


Figure 3.3-1: Relationship between royalty rates and value-added. Adapted from Bradley (1986)

It is observed that there is a negative relationship between the royalty rate and unit price as the policy objective is realized when the unrefined rate shifts down to the refined rate. In the figure above, the area shaded and named 'A' represents the royalty saving which accrues to the mine for taking up a processing operation. Various value-addition costs are added to move the product from ex-mine stage to other stages of refinement, up to the final refined stage. Of this Area A, 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. As the costs increase, the value-added portion reduces. Based on the system's assumptions for the value-addition costs needed to take product to next stage of

processing which are expressed as a share of final product, Bradley concluded that 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 refined production. In other words, he specified that since the value of concentrate is 50% of price for refined metal and additional cost is required to take concentrate to refined metal stage, 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.

After looking at Bradley's conclusions on WA royalty system's processing provisions, deductions can be made for application to the SA context, but before this can be done the similarities and differences between the unique features of the SA and WA royalty regimes must be understood. A similar feature between the royalty systems of WA and SA is the royalty base. The MPRRA's base is gross sales and it is not significantly different from the GVR base of WA, which does not allow for deduction of value-addition or transportation expenditure. However, one of the main differences between the two systems is that the MPRRA allows for royalty rate to be determined via a dual formula system – after a mineral resource has been classified as either refined or unrefined, unlike the WA system which has fixed royalty rates per each stage of processing. The MPRRA's structure for determination of the royalty rate erases the need to have extensive lists for each mineral product based on their different stages of beneficiation or refinement, as its calculation works by varying the royalty rate with profitability (as expressed by EBIT) of the mines for each mineral product transferred. The rate is reduced as beneficiation increases so as to compensate for the higher sales value due to higher prices received for refined products. The rates for refined and unrefined minerals are calculated thus:

Refined rate Y% = $0.5 + \left(\frac{\text{EBIT}}{\text{Aggregate gross sales x } 12.5}\right)$ x 100

OR Y% = $0.5 + \left(\frac{\text{X}}{12.5}\right)$; and

Unrefined rate Y% = $0.5 + \left(\frac{\text{EBIT}}{\text{Aggregate gross sales x 9}}\right)$ x 100

OR Y% = $0.5 + \left(\frac{X}{9}\right)$

From the formula above, the maximum royalty rates payable at maximum profitability (100%) are 5% and 7% for refined and unrefined minerals respectively. The reduced royalty rate of 5% is as a reward for additional costs on value addition.

Apart from the difference in structure of royalty rate specifications of the two systems, another main difference between the WA and SA royalty system is that unlike the WA where there is no minimum royalty for both miners and refiners to start payment from, the SA system does require that both unrefined and refined production pay at least a 0.5% in cases of no profitability. In the model created by Cawood (2011) for the application of Bradley's approach to the SA context, he was able to overcome and factor these highlighted differences between the SA and WA regimes in light of profitability (EBIT) and minimum royalty level components. The Figure 3.3-2 below depicts his work of varying royalty rate with price, like Bradley's work.

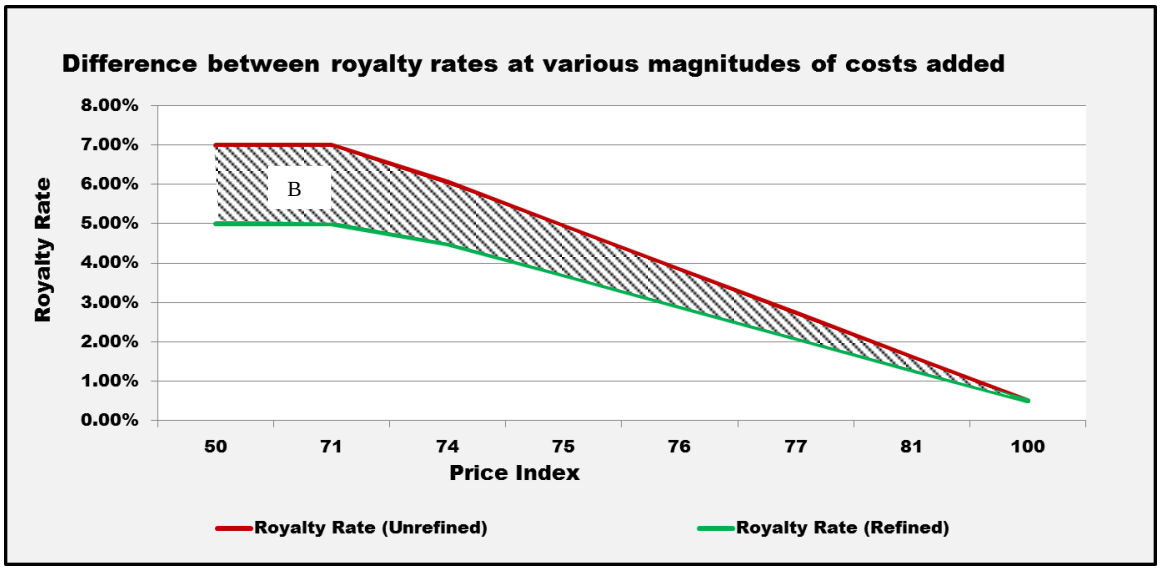


Figure 3.3-2: Relationship between royalty rates and sales price. Adapted from Cawood (2011)

The price index in Figure 3.3-2 represents sales price for final product (either unrefined or refined final product), which is used as a proxy for gross revenue and it consists of different proportions of production costs plus EBIT (profit). For example, at price index of 100, it means that the proportion of production costs is equal to sales price received, implying that no profit was made. This explains why the royalty rate of 0.5% is still paid by the producer at price index 100. Furthermore in Figure 3.3-2, 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.

Further work carried out by Cawood (2011) is shown in the Tables 3.3-1 to 3.3-3 and Figures 3.3-3 to 3.3-5. In Tables 3.3-1 to 3.3-3, price received for refined product (indexed at 100%) expressed as a combination of cost of concentrate plus cost of refinement plus EBIT, different proportions of refinement costs (as a percentage sales price) as well as different proportions of cost of concentrates plus target EBIT margin (as a percentage sales price), were stated. In Figures 3.3-3 to 3.3-5, different proportions of refinement cost, expressed as 10%, 20% and 30% of price of final product were varied against different target EBITs from 0% to 100% plus cost of concentrate, in order to determine the various levels of value-added (given as difference in price received less concentrate cost plus EBIT plus refining cost) that could be obtained. All Tables and Figures below are adapted from Cawood (2011).

Table 3.3-1: Results for refinement cost of 10% and amount of value-added

| **Royalty consideration for determining optimal level of beneficiation using a minimum EBIT as criterion** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Price: Concentrate (C+EBIT) | Price: Refined product (C+Cr+EBIT) | Cost: Refined Product | EBIT | Royalty Rate (Unrefined) | Royalty Rate (Refined) | Desirable Royalty Rate | Royalty | Value Added for Cr of... |
| | | | | | | | | 10 |
| 50 | 100 | 60 | 100 | 7.00% | 5.00% | 5.00% | 5.00 | 40 |
| 71 | 100 | 81 | 60 | 7.00% | 5.00% | 5.00% | 5.00 | 19 |
| 74 | 100 | 84 | 50 | 6.06% | 4.50% | 4.50% | 4.50 | 16 |
| 75 | 100 | 85 | 40 | 4.94% | 3.70% | 3.70% | 3.70 | 15 |
| 76 | 100 | 86 | 30 | 3.83% | 2.90% | 2.90% | 2.90 | 14 |
| 77 | 100 | 87 | 20 | 2.72% | 2.10% | 2.10% | 2.10 | 13 |
| 81 | 100 | 91 | 10 | 1.61% | 1.30% | 1.30% | 1.30 | 9 |
| 100 | 100 | 110 | 0 | 0.50% | 0.50% | 0.50% | 0.50 | -10 |

Expressed graphically as,

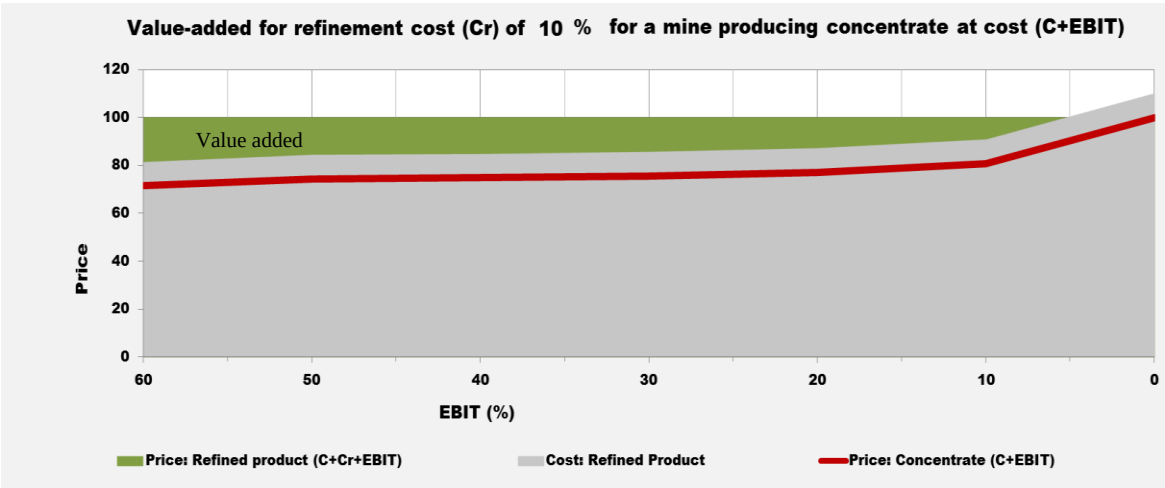


Figure 3.3-3: Value-added for refinement cost of 10%

Table 3.3-2: Results for refinement cost of 20% and amount of value-added

| **Royalty consideration for determining optimal level of beneficiation using a minimum EBIT as criterion** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Price: Concentrate (C+EBIT) | Price: Refined product (C+Cr+EBIT) | Cost: Refined Product | EBIT | Royalty Rate (Unrefined) | Royalty Rate (Refined) | Desirable Royalty Rate | Royalty | Value Added for Cr of... |
| | | | | | | | | 20 |
| 50 | 100 | 70 | 100 | 7.00% | 5.00% | 5.00% | 5.00 | 30 |
| 71 | 100 | 91 | 60 | 7.00% | 5.00% | 5.00% | 5.00 | 9 |
| 74 | 100 | 94 | 50 | 6.06% | 4.50% | 4.50% | 4.50 | 6 |
| 75 | 100 | 95 | 40 | 4.94% | 3.70% | 3.70% | 3.70 | 5 |
| 76 | 100 | 96 | 30 | 3.83% | 2.90% | 2.90% | 2.90 | 4 |
| 77 | 100 | 97 | 20 | 2.72% | 2.10% | 2.10% | 2.10 | 3 |
| 81 | 100 | 101 | 10 | 1.61% | 1.30% | 1.61% | 1.30 | -1 |
| 100 | 100 | 120 | 0 | 0.50% | 0.50% | 0.50% | 0.50 | -20 |

Expressed graphically as,

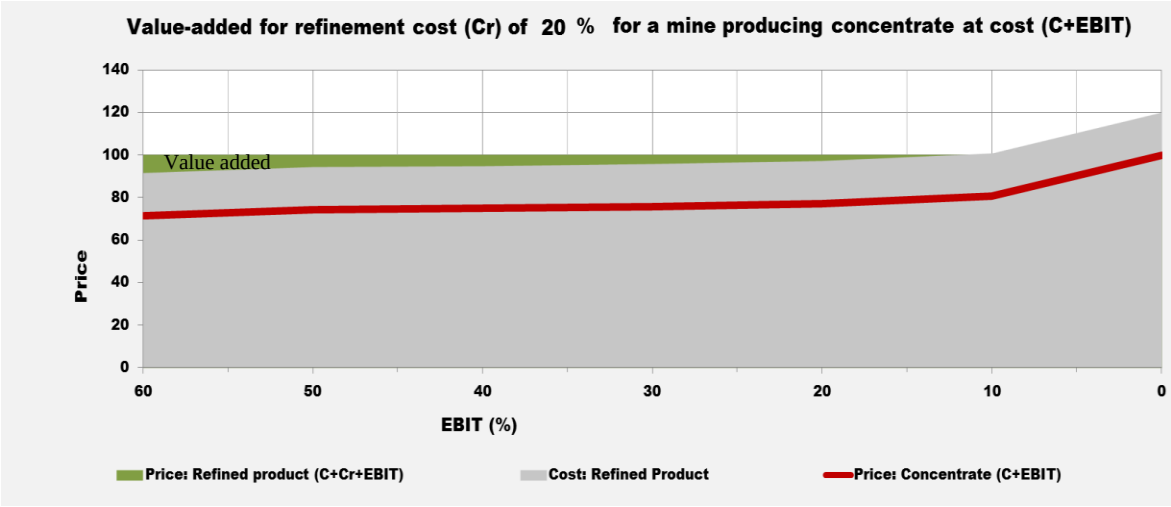


Figure 3.3-4: Value-added for refinement cost of 20%

Table 3.3-3: Results for refinement cost of 30% and amount of value added

| **Royalty consideration for determining optimal level of beneficiation using a minimum EBIT as criterion** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Price: Concentrate (C+EBIT) | Price: Refined product (C+Cr+EBIT) | Cost: Refined Product | EBIT | Royalty Rate (Unrefined) | Royalty Rate (Refined) | Desirable Royalty Rate | Royalty | Value Added for Cr of... |
| | | | | | | | | 30 |
| 50 | 100 | 80 | 100 | 7.00% | 5.00% | 5.00% | 5.00 | 20 |
| 71 | 100 | 101 | 60 | 7.00% | 5.00% | 7.00% | 5.00 | -1 |
| 74 | 100 | 104 | 50 | 6.06% | 4.50% | 6.06% | 4.50 | -4 |
| 75 | 100 | 105 | 40 | 4.94% | 3.70% | 4.94% | 3.70 | -5 |
| 76 | 100 | 106 | 30 | 3.83% | 2.90% | 3.83% | 2.90 | -6 |
| 77 | 100 | 107 | 20 | 2.72% | 2.10% | 2.72% | 2.10 | -7 |
| 81 | 100 | 111 | 10 | 1.61% | 1.30% | 1.61% | 1.30 | -11 |
| 100 | 100 | 130 | 0 | 0.50% | 0.50% | 0.50% | 0.50 | -30 |

Expressed graphically as,

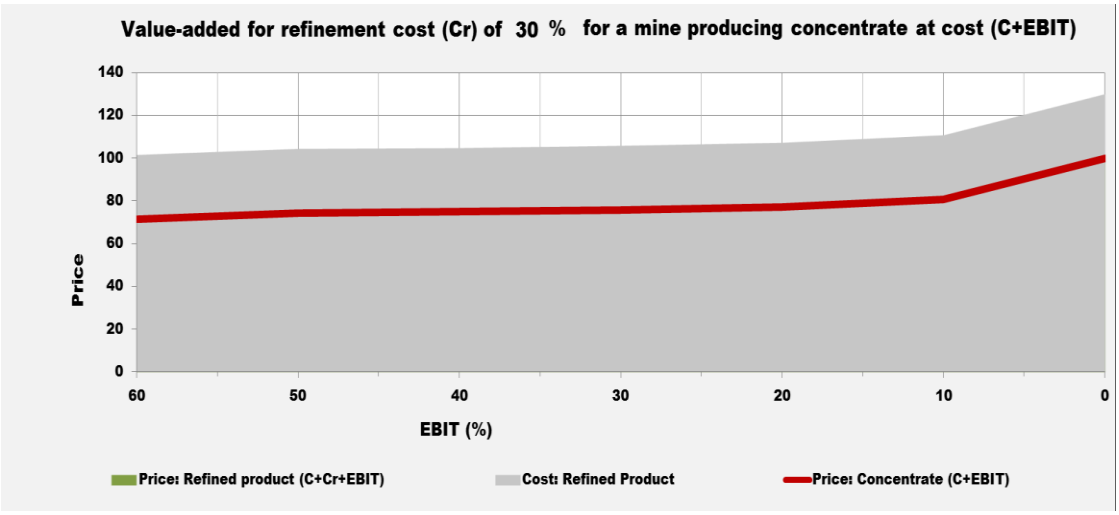


Figure 3.3-5: Value-added for refinement cost of 30%

From the above, it is observed that significant value is added if refining cost is 10% of final price, little value is added when refining cost is 20% of price received but negative value is added at refining cost is 30% of price received. It can be drawn that if refining costs are above 20% of sales price, adding on refining facility would be of detrimental value to the miner.

Furthermore, in terms of varying royalty rate specifications of unrefined and refined minerals with price received expressed as a combination of different levels of concentrate price plus different targets of profitability plus different level of refining costs, it can be observed from figures below that the policy objective of reduced royalty for refined minerals would not be beneficial and the use of unrefined royalty formula preferred, if proportion of total cost (C + Cr + EBIT) is 90% (and over) of price received, when refining cost is 10% of price received (or less). When refining cost is 20% of price received, it can be observed that the policy objective of reduced royalty for refined minerals would not be beneficial and the use of unrefined royalty formula preferred, if proportion of total cost (C + Cr + EBIT) is 80% (and over) of price received. When refining cost is 30% of price received, it can be observed that the policy objective of reduced royalty for refined minerals would not be beneficial and the use of unrefined royalty formula preferred, if proportion of total cost (C + Cr + EBIT) is less than 70% (and over) of price received.

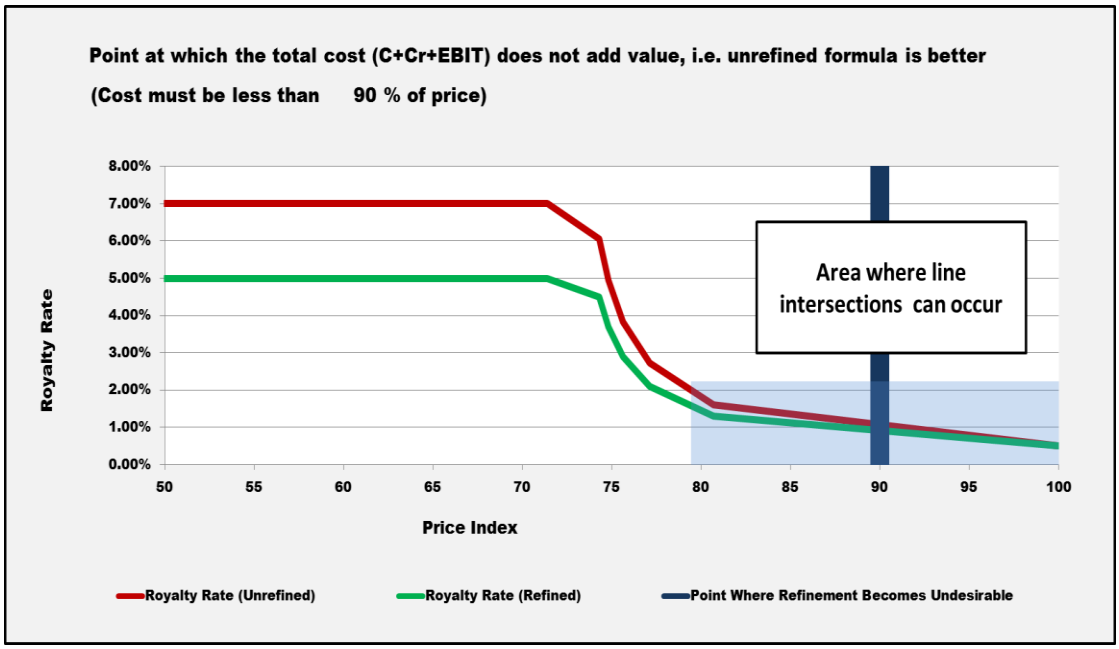


Figure 3.3-6: Point at which unrefined royalty rate is beneficial, in light of total costs and refinement cost of 10% of sales price

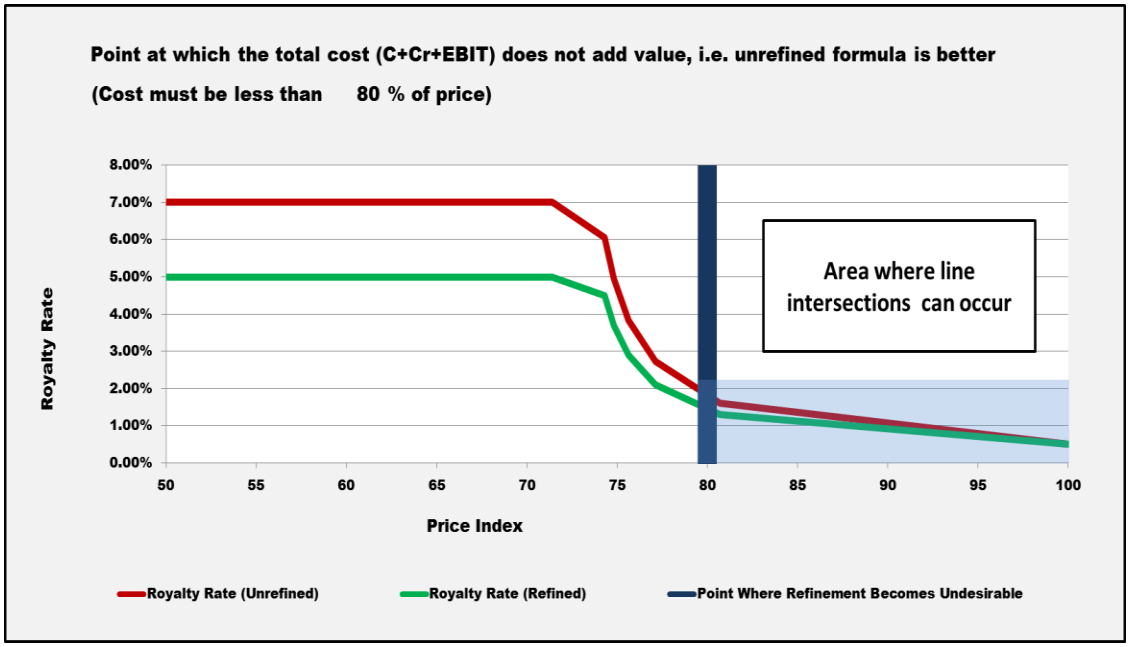


Figure 3.3-7: Point at which unrefined royalty rate is beneficial, in light of total costs and refinement cost of 20% of sales price

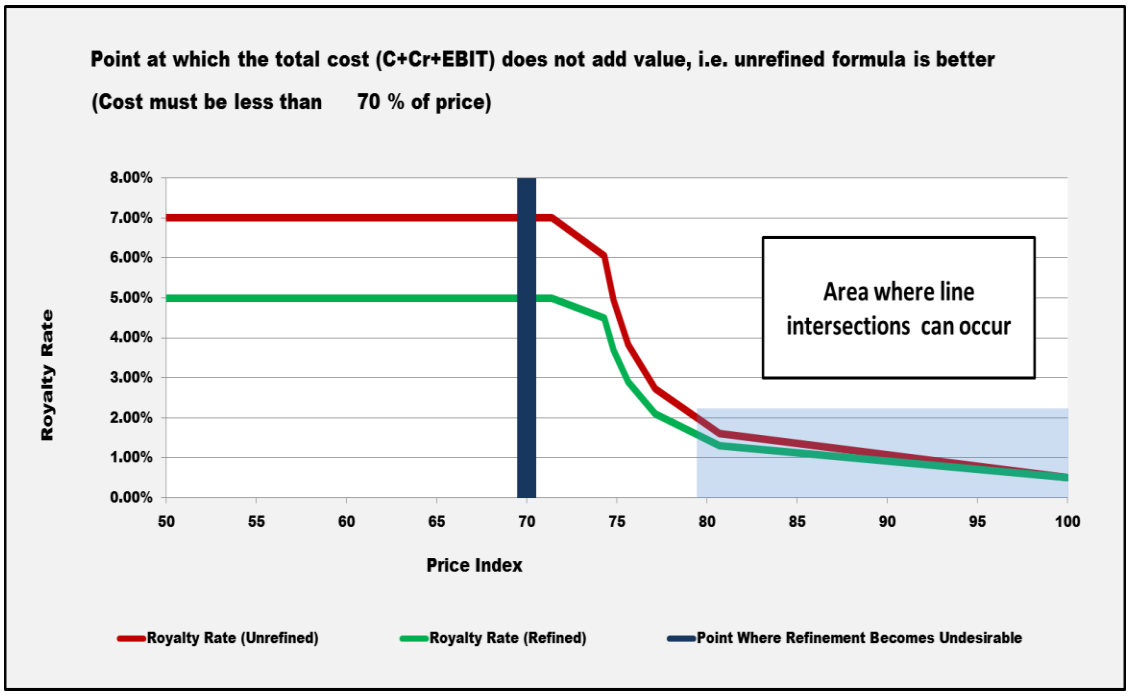


Figure 3.3-8: Point at which unrefined royalty rate is beneficial, in light of total costs and refinement cost of 30% of sales price

Comparing SA regime with Bradley's work on the WA system, the gap available to support value-add (Area B depicting royalty savings according to the Cawood model) becomes smaller. It also appears quite insignificant when compared to the area A in Bradley's model, as processing costs increase and one moves closer to the intersection. Value-added to profitability also reduces as value addition costs go over 10% of price received, unlike in WA system where this only occurs when costs to take concentrate to refined level go over 50% of price received for final product.

## 3.4 CONCLUSION

In summary, from the initial review of WA system, it was observed that GVRs are very inequitable and they also lead to economic inefficiency. Also, as regards de facto royalties in the form of processing commitments which were a feature of many of the

agreements in WA, from consideration of several case histories, it appeared that the significance of these form of royalties was exaggerated and that in practice royalties with processing requirements did not greatly afford large gains to the State in comparison with revenue from conventional royalties. It was noted that since standardization is regarded as a desirable feature of a royalty system and de facto royalties were discretionary and required a 'roll your own' approach, they could not be regarded as preferred instruments of royalty policy. As it appeared, the importance of processing obligations was not great enough to warrant their use as a royalty instrument.

In conclusion, according to Bradley's study on the processing provisions of the WA system, since the system was not dependent on any profitability component before assessment of the royalty payment, if processing cost (e.g. cost needed to take concentrate to refined metal) is at most 50% of refined value, the miner-turned-refiner would still have significant value added to his project, enough to pay royalty. Processing costs over 50% of sales price would yield no significant value added and zero motivation for further mineral processing. In SA's case, according to the model by Cawood, if in light of royalty payment, the beneficiation costs (from concentrate to final product) was 10% of sales price or less, the value added would be high and the miner would be encouraged to become a refiner but as value-addition costs go over 10%, the value added diminishes, and from 30% and above, there is no value added, therefore, incentive for miners to become refiners is non-existent. From the model, it can also be concluded that the small gap between the refined and unrefined royalty rates is not sufficiently wide enough to motivate miners who sell raw production to become refiners.

Furthermore, in the following chapter, the model developed by Cawood based on Bradley's approach would be applied to real-time data from SA mining operations or projects so as to further investigate whether or not the policy intent of motivating

mineral producers to add sufficient value to production, so that the sales product meet the Royalty Act's definition for a refined mineral resource, would be achieved.

# CHAPTER FOUR

# IMPACT OF MPRRA ON THE SOUTH AFRICAN MINING INDUSTRY AND ITS CONTRIBUTION TO THE SOUTH AFRICAN ECONOMY

## 4.1 INTRODUCTION

From the previous chapters, it has been established that both mineral-rich States and mining companies are in the business of mineral development to earn economic returns. For the State, economic returns earned serve as compensation for exploiting the State's patrimony and for funding its provision of socio-economic benefits to its citizens. For the mining companies, sufficient economic returns are required in order to compensate and justify the significant amounts of capital that they have invested in the risky mining business, as well as for maximizing shareholders' wealth, attracting investors and sustenance of their market positions. These economic returns have been captured over time by States through the use of various mining fiscal instruments, which have been listed briefly in chapter one. As highlighted in previous chapters, the focus of this report has been on viewing the impact of fiscal (royalty) instruments from the perspective of the mining companies, in terms of compensating their investment risks as well as assessing the impact of the policy's mineral beneficiation objectives on their business' profitability.

Mining companies view these fiscal instruments as placing additional cost burdens on the substantial amount of costs incurred in mineral recovery, which reduces their profit margins to a great extent. Therefore, it has been a major challenge for governments to devise appropriate taxation systems that will balance both government and company expectations from mineral development (wealth). Governments have had to take caution to ensure that the revenue-generation objective of the fiscal policy environment they provide also satisfies investors' objectives. They have had to work progressively to see that their policies allow sufficient funds to flow

to investors, thereby, preventing investors from leaving their countries for other more attractive investor-friendly jurisdictions as well as attracting more investment. The progressive creation of favourable mineral investment climates would prevent the underdevelopment of their mineral resources.

From the foregoing, a royalty instrument which provides that developers undertaking further mineral processing will pay a lower royalty rate than developers that extract minerals only, must significantly encourage this investment decision. The magnitude of the financial benefit that would be added by this incentive to the developer's profitability must be substantial enough to justify the sizeable amount of invested capital and operating costs that would be used-up with adding-on beneficiation facilities.

A few examples of mineral-rich countries whose royalty instruments contain beneficiation provisions were looked at in chapter one, and in chapter three, the WA example was chosen to establish the methodology for assessing whether the beneficiation objective of the SA's new royalty regime will be achieved. This methodology was based on the work done by Cawood (2011), which was abstracted from Bradley's conclusions and recommendations as regards the mineral processing provisions of WA's royalty system.

This chapter seeks to briefly highlight the effect that the imposition of the MPRRA would have on the South African mining industry and its contribution to the economy. The platinum sub-sector is identified as a suitable case study for the purpose of assessing if the MPRRA will sufficiently motivate miners to become refiners.

## 4.2 THE MPRRA AND SOUTH AFRICAN MINING INDUSTRY

Advancements in urbanization and industrialization have resulted in constantly changing economic and technical global trends and concerns such as increasing competition for investment funds, increased call for sustainable development, diminishing purchasing power of raw mineral producing countries as terms of trade for raw mineral exports have reduced as compared with manufactured goods etc. With these evolving trends, countries have had to frequently review their mineral investment (fiscal) policies and legislations so as to ameliorate these concerns and still remain fair and equitable to all affected parties (stakeholders). With the momentous contribution that the mining industry makes to the country, South Africa's mining fiscal policies have not been left out in these review exercises. These policies have been made to continually adapt to changing local and international world conditions. Developing fair and equitable policies which address the above concerns coupled with the different objectives of both government and companies from mineral rent, has proved to be a major challenge and has always called for a great deal of wisdom.

As regards royalty policy instruments, when royalties are charged, the claim is made on a portion of resource value (Bradley, 1986) and even though mining companies are comfortable with paying mineral royalties, they view its impact on the amount of net resource value (profitability) accruing to them with scepticism. Mining companies want their projects to be able to afford the royalty payments but as they are in business to maximize their return, they are more concerned with the returns after deduction of royalties. Therefore, from the developer's point of view, an inequitable royalty policy which jeopardizes a project economically because of the higher pay-limit can result in the choice of a development plan which differs from the optimal one. The new development plan (encouraging selective mining of higher grade ore only) will maximize net returns after royalties to the developer, but will lead to a reduction in the net resource value that will be available to be shared between the

developer and the State who levied the royalty (Bradley, 1986). With the failure to develop resources in the manner that will realize their full net value and reduction in the size of net resource value below what it would have been in the absence of the royalty, this would lead to an inefficient royalty system which invariably results in a loss to the economy.

Although, the idea of a perfectly efficient or non-distorting royalty system is unattainable, the development of the MPRRA, took an extensive process of consultation and debate so that the efficiency criterion might be addressed adequately. The provisions of the royalty regime seem to be workable and fair, while at the same time causing only minimal distortions. This implies that royalty payments would not cause developers to change investment decisions or operators to alter production plans. According to the statistics provided by Statistics South Africa (Stats SA), when the new royalty regime was built into the financial data of previous years, it was found that the mineral sector would become even more important to the national economy, with a close to 8% rise in mining's contribution to company taxes.

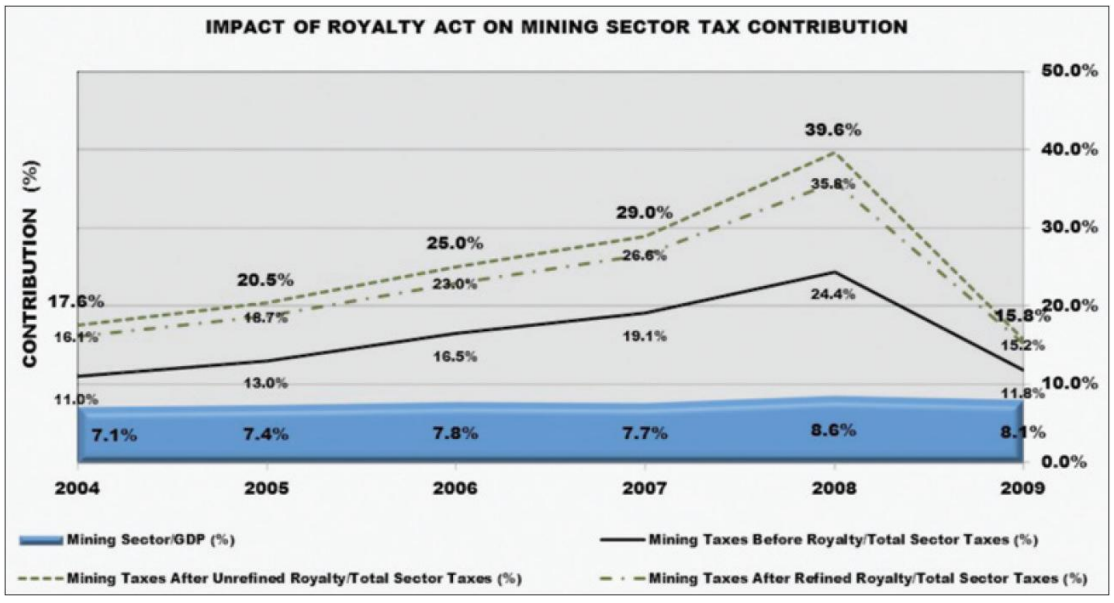


Figure 4.2-1: Impact of the new royalty on mining taxes. Source: Stats SA in Cawood (2011)

From the Figure 4.2-1, with the new royalty regime for unrefined minerals being fabricated into the historical data-set, as regards contribution to State revenue, it can be observed that the gap between the chain and broken lines shows that refiners contribute lesser than miners to fiscus. Also, this gap shows that when minerals are not beneficiated to the levels stipulated in the Royalty Act, the producer would be penalized (Cawood, 2011). However, in light of the work carried out by Cawood, from the miner's perspective, this 'penalty' would only be worth avoiding by adding on beneficiation facilities, if its beneficiation cost is less than or equal to 10% of sales price, or slightly over 10%. See Figures 4.2-2 and 4.2-3:

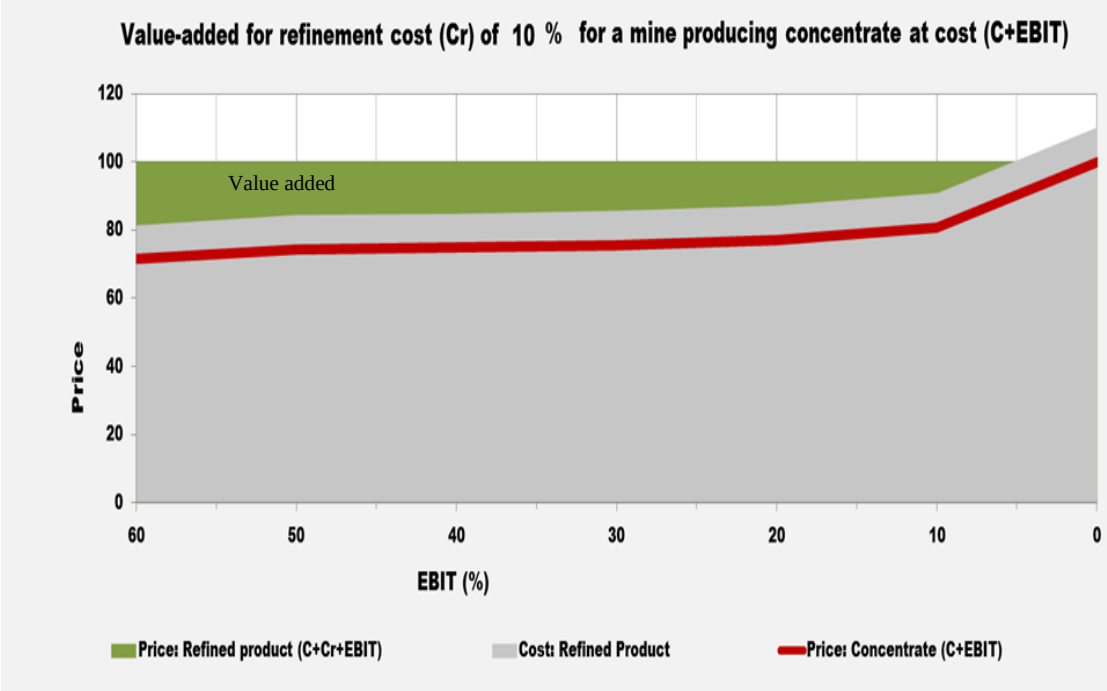


Figure 4.2- 2: Value-added for refinement cost of 10%. Adapted from Cawood (2011)

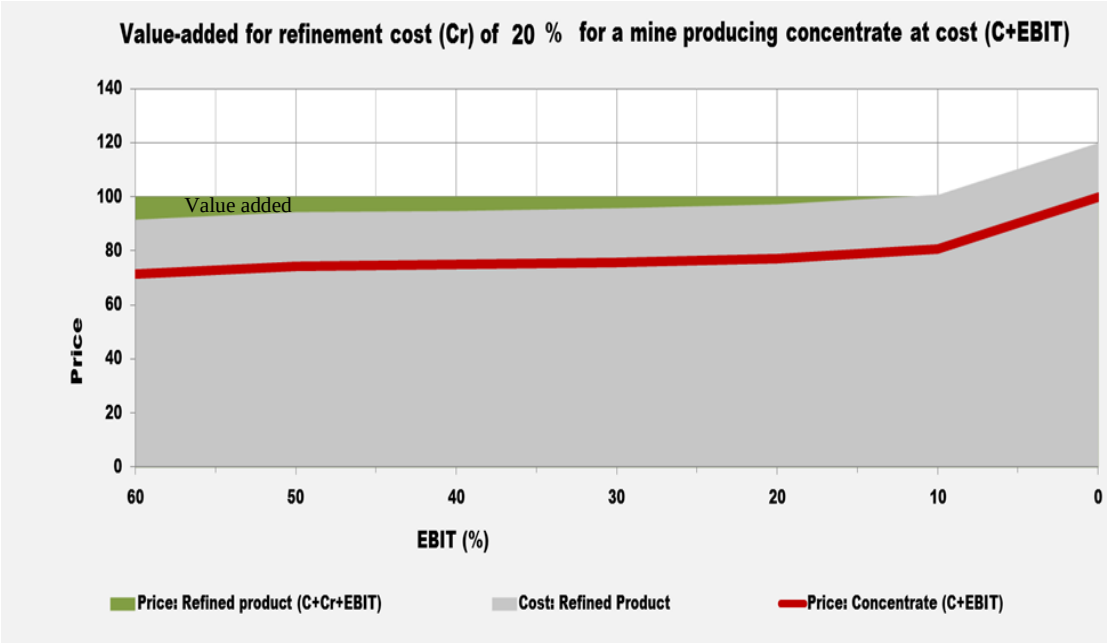


Figure 4.2- 3: Value-added for refinement cost of 20%. Adapted from Cawood (2011)

As mentioned in chapter three, based on the work carried out by Cawood (2011), the gap between the refined and unrefined royalty rates is not sufficiently wide enough to encourage miners who sell raw production to become refiners.

Furthermore, from the view of all South African mineral producers, the new SA mining royalty, which became effective from March 2010, has been pointed to as adding a significant additional cost to the mining sector (PWC, 2010). Figure 4.2-2 below was used to substantiate this and to determine the potential impact of the royalty regime on the profitability of mining companies, by comparing the actual profitability of mining companies (solid line) with the results obtained when the royalty regime using the unrefined royalty formula, was factored into the cash flow of past years (broken line). The gap showed that the new royalty regime would have a downward effect on profitability of about 2% (Cawood, 2011).

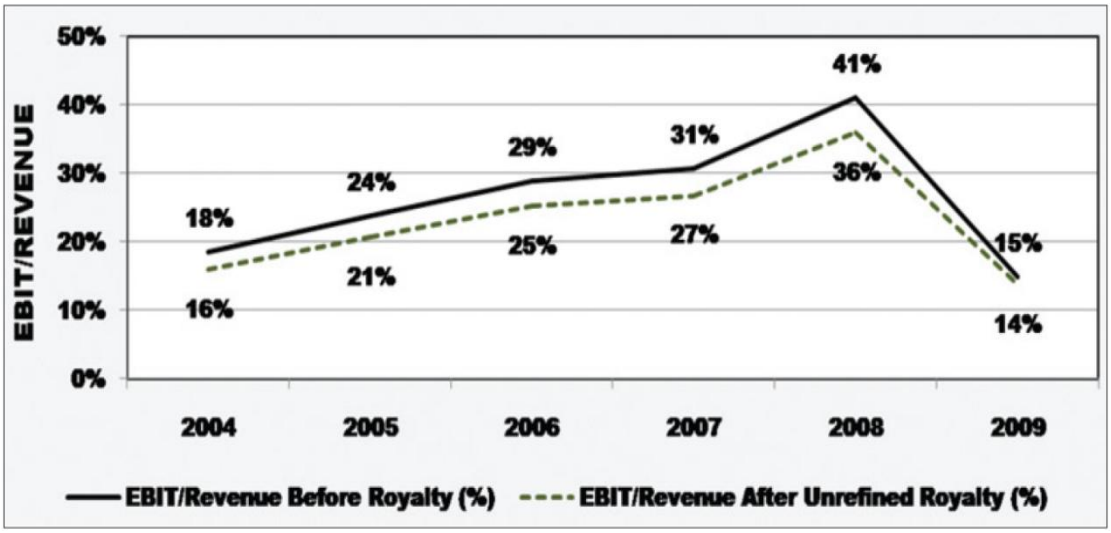


Figure 4.2- 4: Potential impact of the Royalty Act on mining industry profitability. Source: Stats SA in Cawood (2011)

## 4.3 JUSTIFICATION FOR THE USE OF PLATINUM INDUSTRY

The total amount of revenue and de facto (job creation, infrastructure, mineral processing, and foreign exchange earnings) benefits collected by the government from mining operations as well as the amount of capital employed in mining indicate the importance of the industry in the economy.

As widely known, South Africa is well-endowed with an abundance of mineral resources which accounted for a significant proportion of both world production and reserves and the mineral resources remain the cornerstone of the South African economy. As at 2010, the South African mining sector contributed about 9.6% to total GDP, 15.3% to South Africa's total export revenue (Topf, 2012) and accounts for 18% (9% direct) of investment (Baxter, 2011). See Table 4.3-1:

Table 4.3- 1: Mining sector's contribution to the South African economy

| | **Year 2010** | **Year 2009** |
|---|---|---|
| % of GDP | 5% | 6% |
| % of total corporation tax income to SARS | 8% | 13% |
| Number of people employed in industry | 503,000 | 488,000 |
| Average monthly earnings in industry | R12,618 | R12,035 |
| Average monthly earnings across all industries | R11,825 | R11,020 |

Source: PWC (2010)

From the Table 4.3-1, it is apparent that the mining industry is a major contributor to South Africa's wealth. In terms of government revenue, the total tax contribution survey carried out by PWC in 2010, showed the noteworthy contribution that the mining industry contributes to the fiscus. For determination of the order of importance of fiscal contributions made by mining companies to State revenue, a cash flow analysis of the government's share of rents was carried out by Cawood and Minnitt in 2001. It was found that the Corporate Income Tax stood as the most important contributor, the second most important minerals tax instrument was the Mineral royalty (even though royalty payments to the State were not mandatory in South Africa as at that time). The remainder of the host country's share of mineral rent was made up of minor taxes, fees and other levies that have 'nuisance' value (Cawood and Minnitt, 2001). As at 2010, on average, it was observed that mining companies contributed an amount equivalent to 9.45% (2009: 8.1%) of their turnover to government of which corporate income tax make up about 79% (2009: 48%) of all

taxes and contributions borne by them (PWC, 2010). Also, according to the Chamber of Mines of South Africa, in 2009, the industry contributed between 10% and 20% of direct corporate tax receipts (together worth R10.5-billion).

Historically, gold lay as the biggest revenue-generating commodity in SA but from 2005, coal and platinum group metals (PGMs) overtook gold's position. In 2010, PGMs retained the top spot as the biggest revenue generator, followed by coal, which was as a result of better price recovery for PGMs.

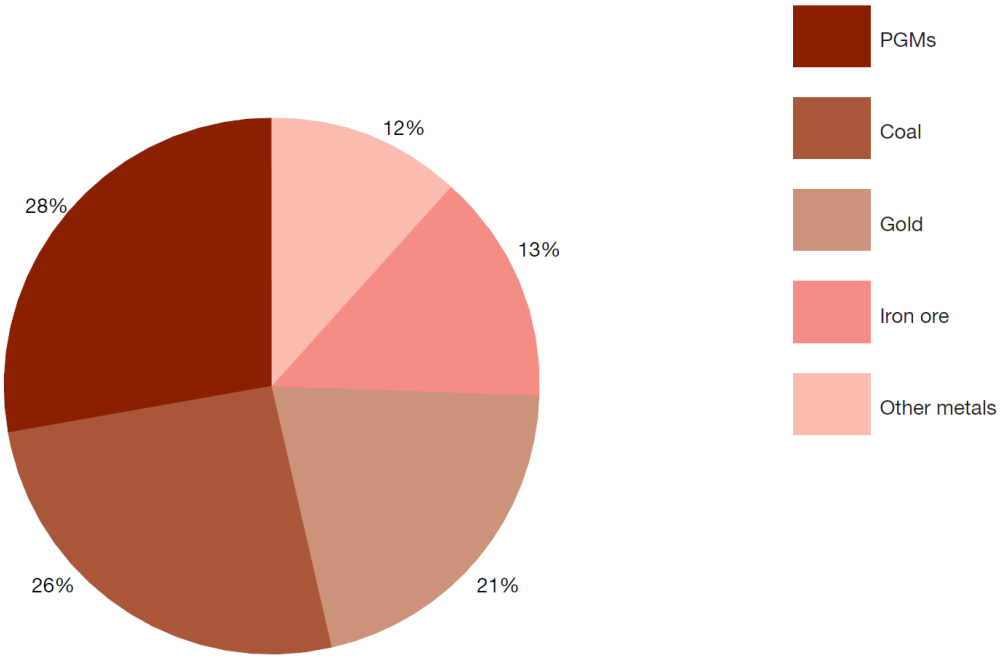


Figure 4.3-1: Percentage mining revenue per commodity as at June 2010. Source: Stats SA in PWC (2010)

In Figures 4.3-1 and 4.3-2, according to PWC (2010), the relative breakdown of mining revenues, excluding other non-metallic ores for the 12 months to June 2010, is as follows:

- PGMs: R64.9 billion (2009: R68.9 billion)
- Coal: R60.3 billion (2009: R68.6 billion)

- Gold: R48.8 billion (2009: R47.9 billion)
- Iron ore: R31.6 billion (2009: R27.6 billion)
- Other metallic minerals (including manganese, copper and nickel): R28.0 billion (2009: R29.1 billion)

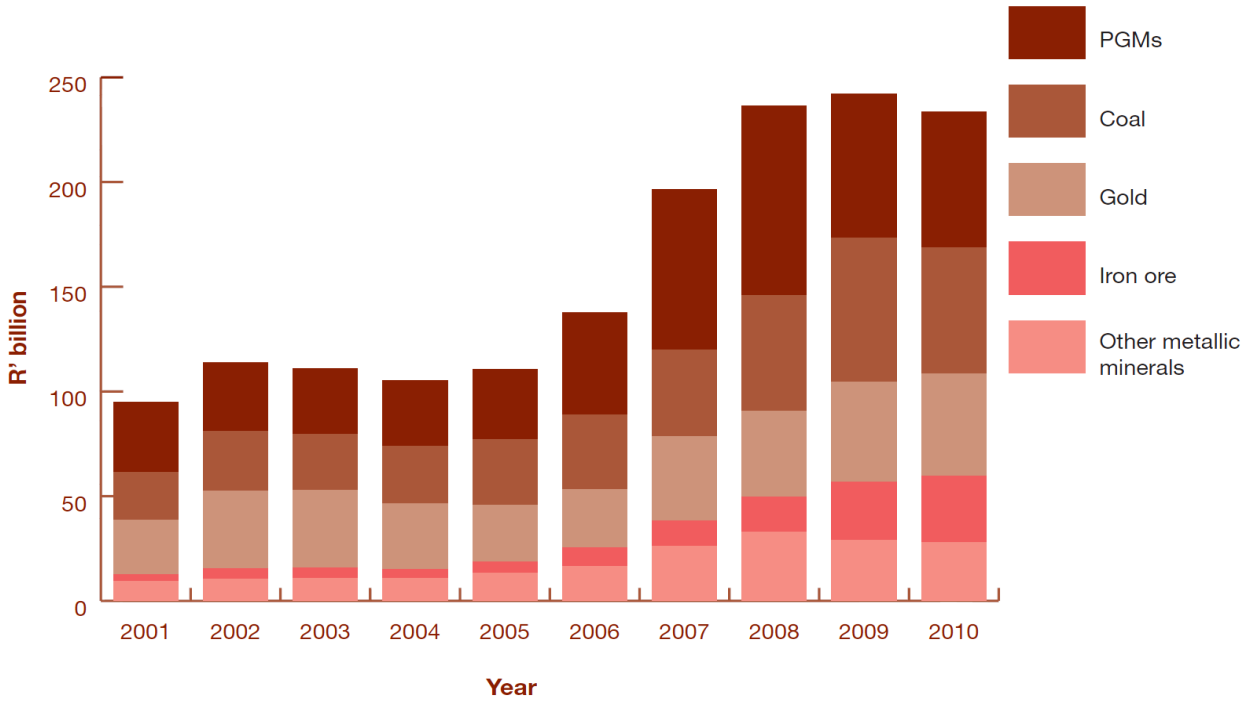


Figure 4.3-2: Annual mining revenue to June 2010. Source: Stats SA in PWC (2010)

As mentioned previously, the MPRRA came into force in March 2010, but in 2009, Stats SA carried out an exercise whereby the new royalty regime was built into the 2009 mining industry financial data. This exercise was done to determine which mining sub-sector would contribute the most to the collection of mineral royalties, assuming the MPRRA was in force as at that year. It was observed that coal would have been the biggest contributor (28%), followed by PGMs (25%), manganese (11%). See Figure 4.3-3 below:

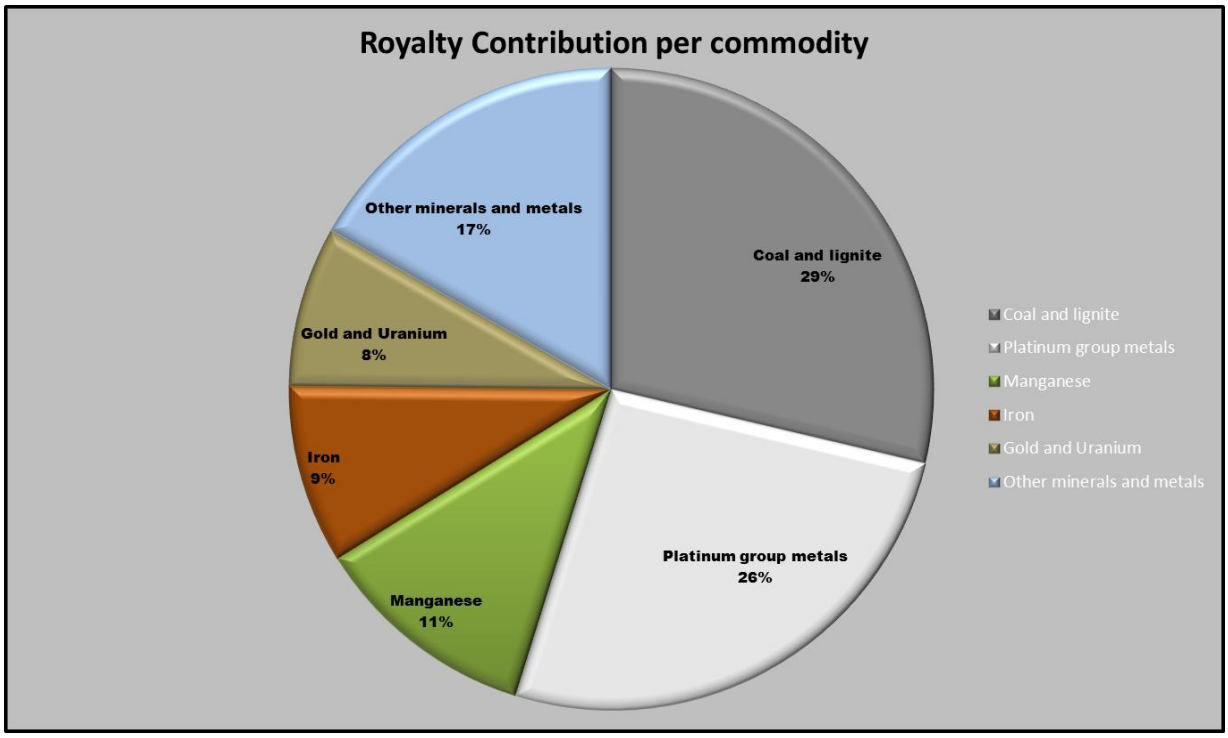


Figure 4.3-3: Royalty Contribution per commodity. Source: Stats SA (2009) in Cawood (2011)

However, for the purpose of this paper which mainly focuses on the beneficiation (refining) provision of SA's royalty regime, the second highest contributor to the royalty pool – PGMs – was settled for instead of coal. This is due to the fact that Platinum (PGMs) is termed a dual schedule material (i.e. it can be either processed to refined condition of 99.9% purity and above or unrefined conditions of less than 99.9%) unlike coal which is classified as an unrefined mineral resource according to the specifications of the Schedules in the MPRRA.

### 4.3.1 Brief overview of PGMs

Platinum group metals (PGMs) are valuable assets due to the scarcity of their availability, functionalities and high economic value. They are used for various luxury, fashion and industrial purposes such as – alloying agents for various metal

products including fine wires, production of white gold, non-corrosive laboratory containers, medical instruments, jewellery, dental equipment, electrical contacts, and thermocouples, catalytic converters for the automotive industry. (Precious Metal Investment.com, 2006). They are also all equally attractive investment vehicles because of the speculative profit opportunities they afford (Gold Trends Bullion Exchange, 2009). Also, in times of global economic uncertainty, they are considered as 'storers' of value that represent attractive means of investment security. The ever-increasing demand for each of the PGMs varies widely. The members of the PGM family include (but not exhaustive) – platinum, rhodium, palladium – and some of its by products are gold, copper, nickel, cobalt.

South Africa possesses a vast and competitive Platinum resource base, as South Africa is known to hold the biggest platinum deposits in the world, having its main platinum field in the Bushveld Igneous Complex.

Mining of PGMs is carried out through conventional underground or open-pit operations, in various stages- extraction, grinding, gravity-based separation, flotation concentration, smelting and refining. As stated by Mudd and Glaister (2009), "the ore grade for PGM mineralization is similar to gold, at grams per tonne (g/t), but the processing is more analogous to base metals (at percent)".

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 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 (Stillwater Palladium, 2008).

The substantial amount of process stages involved in recovery of PGMs indicates that large amounts of capital is required to fund PGM mining projects. This therefore informs the thorough analysis of the impact of the MPRRA on profitability, to

ascertain if it would be worthwhile to invest more capital to move production to refining stage.

## 4.4 CONCLUSION

In this chapter, the mining industry was shown as a very significant contributor to South Africa's wealth. It was also indicated that with the imposition of the MPRRA, the industry would add yet more substantial value to the economy over and above the government's receipts from income and other taxes from mining companies. Furthermore, the PGM sector, which comprises of the metals of the future – platinum, rhodium, and palladium, was identified as the biggest contributor to government revenue in terms of taxes and other contributions, and second biggest contributor in terms of the collection of mineral royalties.

Therefore, the PGM sector was established as the focus of the economic analysis of this project, not only because of its significant position in order of contribution to government receipts but most importantly, because of its dual state of either unrefined (concentrate) or refined product. However, in this chapter, it was also demonstrated that miners are not likely to become refiners when refinement costs are more than 20% of the total sales price.

In the next chapter, real-time data of beneficiation cost (as percentages of sales price) and profitability ratios of a platinum company would be used to ascertain whether on addition of further mineral processing expenditures, the amount of value added to miners is sufficient enough to inspire their upgrade to becoming refiners.

# CHAPTER FIVE

# RESULTS AND ANALYSIS OF PLATINUM CASE STUDY

## 5.1 INTRODUCTION

In the previous chapters, it was established that mineral-rich countries using their mineral fiscal policies to motivate the set-up of value-addition facilities, is appropriate. Therefore, South Africa's use of the MPRRA to support its beneficiation strategy is based on a sound principle.

In chapter four, it was shown that the South African mining industry contributes substantially to the South African economy and with the imposition of the MPRRA, its importance to the economy would be yet greater. Furthermore, in that chapter after analysis of which mining sub-sectors would contribute the highest amounts of revenue to the government in terms of the MPRRA, coal and PGM sectors were identified as first and second, respectively.

However, for the purpose of this project's assessment of MPRRA's refining objectives, the PGM sector was settled for. This is based on the fact that PGMs can be termed as dual schedule materials. This means that PGMs can be processed either to refined condition of 99.9% purity and above or unrefined conditions of less than 99.9%) unlike coal which is classified as an unrefined mineral resource according to the specifications of the Schedules in the MPRRA.

Having established the PGM sector as the focus of the econometric analysis of this project, this chapter proceeds to apply the methodology of this report to real-time data of beneficiation cost (as percentages of sales price) and profitability ratios from a platinum company. This analysis was carried out so as to ascertain whether on addition of further mineral processing expenditures, the amount of value added to

financial position of miners is sufficient enough to inspire their upgrade to becoming refiners.

The platinum company used was Anglo American Platinum Limited, hereinafter called “Amplats”. This company was chosen because of its dominant position in the platinum mining industry, the quality of mining and refining operations it carries out, and it reports adequate information in sufficient detail.

## 5.2 OVERVIEW OF THE OPERATIONS OF ANGLO AMERICAN PLATINUM LIMITED

Anglo American Platinum Limited (formerly known as Anglo Platinum Limited) stands in the number one position among the world’s primary producers of platinum (PGM). In 2009, its market share of global newly mined platinum was about 40% (Amplats, 2010). Amplats is a global mining company which possesses South African roots and owns a significant PGM asset base in the South African Bushveld Igneous Complex. It owns and operates various mines and concentrators, as well as three Smelters, a Base Metals Refinery and a Precious Metals Refinery in South Africa. On some of its operations, it is engaged in several joint ventures with companies like Anooraq Resources Corporation, Aquarius Platinum Limited.

It extracts PGMs from Plat reef, Merensky and UG2 reefs. As stated by Jacobs (2006), its process route is as follows:

a. Ore from mining operations is transferred to its concentrators, where it is crushed, milled and separated by sulphide flotation, so that the base metals sulphides and associated platinum group (PGM) content are concentrated;
b. Concentrate is transported to any of the three smelters for drying and smelting in electric furnaces, for the production of furnace matte;

c. Furnace matte from electric furnaces is sent to the Anglo Converting Process (ACP) at Waterval Smelter Complex for removal of excess iron sulphide; and

d. The resultant converter matte product is bottom cast, slow-cooled, crushed and sent to the Magnetic Concentration Plant (MCP) at the Rustenburg Base Metals Refinery (RBMR). Here, the remaining part consisting magnetic PGM is removed and sent to Precious Metals Refinery (PMR). At the PMR, the PGMs are separated and refined to produce pure metals, while the remaining material is treated at the RBMR for the recovery of by-products – nickel, copper and cobalt. The PMR currently produces platinum at better than 99.99% pure.

## 5.3 DATA USED

Due to the fact that Amplats has both mining and refining operations unlike almost all other platinum companies in South Africa, it is suitable for the assessment required in this report. The data used in this report is based on publicly available information – mainly Amplats annual reports (2010, 2008 and 2007). The company's capacity to provide quality information is hereby well acknowledged.

Additional data on metal in concentrate prices received at Kroondal and Marikana mines were taken from Aquarius annual reports. As mentioned earlier, Aquarius is one of the companies in joint venture agreement with Amplats. Aquarius entered into Pooling and Sharing Agreements – (P&SA1) and (P&SA2) – with Amplats for mining operations at Kroondal and Marikana Mines, respectively. The Kroondal (P&SA1) agreement was instituted in 2003, while the Marikana (P&SA2) was instituted in 2005. The companies combine their assets for joint exploration of resources and use of infrastructure so that the resulting production Amplats' and financial outcomes are split on a 50:50 basis (Aquarius Platinum Limited, 2006). Amplats smelts, refines and markets its share of the metal in concentrate which are produced at these two mines.

### 5.3.1 General Assumptions

- This project's analysis aimed at checking the impact of imputing the MPRR regime into historical financial data of years before the Act came into force i.e. from 2009 backwards, so as to postulate future behaviour of the industry. However, even though the Act became effective from March 2010, financial data of 2010 was added in this analysis because it was not clearly stated in the 2010 annual reports if royalty payments had already been factored into quoted figures;

- According to Cawood (2010), "EBIT is defined in the Act as gross sales after adding recoupments under the Income Tax Act (ITA) minus capital expenditure minus operating expenditure…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….". Capital expenditure is included so as to have the effect of reducing royalty payable;

  However, in calculating EBIT for this analysis in progressive sections, the Capital expenditures (Capex) in the 'Base case' were excluded, due to the fact that information concerning initial project capital which could have been redeemed was not accessible as at time of analysis. Also, based on the work done by Cawood (2011), in terms of obtaining proportion of refinement costs of the Sales price received for refined product, the effect of only operational costs on EBIT (for royalty calculation) seemed to suffice, as any additional costs – Capex – would only amplify the situation (proportion of refining costs); and

- Another general assumption is that the analysis carried out in this report supposes that with all things being equal, a producer (miner) can decide on becoming a refiner or not, with reference to the results and findings of this research. It also supposes that the producer is not risk-averse and that the global

economic factors and market dynamics remain the same as in the years used for the assessment in this report.

## 5.4 GROUP ANALYSIS – REFINED PGM PRODUCTION

### 5.4.1 Discussions

Table 5.4-1: Group Analysis- Refined PGM production (Base case)

| ANGLO AMERICAN PLATINUM (Group analysis- Refined PGM) Base case | | | | | | |
|---|---|---|---|---|---|---|
| | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
| Gross revenue | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| Mining costs | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| Purchased metals | R | 3 947 000 000 | 5 539 000 000 | 8 999 000 000 | 6 689 000 000 | 9 215 000 000 |
| Smelting costs | R | 1 238 000 000 | 1 314 000 000 | 1 625 000 000 | 1 881 000 000 | 1 846 000 000 |
| Treatment and Refining costs | R | 915 000 000 | 1 047 000 000 | 1 151 000 000 | 1 460 000 000 | 1 467 000 000 |
| EBIT before Royalty | R | 20 273 000 000 | 22 936 000 000 | 19 100 000 000 | 7 374 000 000 | 13 905 000 000 |
| EBIT/Revenue before Royalty | % | 51.51% | 48.84% | 37.36% | 19.96% | 30.00% |
| Refined Royalty Rate | % | 4.62 | 4.41 | 3.49 | 2.10 | 2.90 |
| Royalty paid | R | 1 818 620 000 | 2 069 685 000 | 1 783 590 000 | 774 655 000 | 1 344 160 000 |
| EBIT after Royalty | R | 18 454 380 000 | 20 866 315 000 | 17 316 410 000 | 6 599 345 000 | 12 560 840 000 |
| EBIT/Revenue after Royalty | % | 46.89% | 44.43% | 33.88% | 17.86% | 27.10% |

Source: See Appendix 1A

In the Table 5.4-1,

- Gross revenue used was as taken from Amplats annual reports;

- Operating costs that were attributed to refined PGM and deducted from gross revenue to give 'EBIT before royalty' include: mining costs, purchased metals, smelting costs and treatment and refining costs; and
- For the purpose of calculating proportion (or percentage) of refinement cost of sales price received for refined product based on the work done by Cawood (2011), the costs used which were directly attributed to the refining operation include purchased metals, smelting costs and treatment and refining costs.

### 5.4.2 Data processing and analysis

Table 5.4-2: Calculations for EBIT, EBIT/Revenue (Profitability) before and after royalty, and royalty payment for Refined PGM production

| (R) | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT before Royalty (Refined) | R | 20 273 000 000 | 22 936 000 000 | 19 100 000 000 | 7 374 000 000 | 13 905 000 000 |
| EBIT/Revenue before Royalty (Refined) | % | 51.51% | 48.84% | 37.36% | 19.96% | 30.00% |
| Refined Royalty Rate | % | 4.62 | 4.41 | 3.49 | 2.10 | 2.90 |
| Royalty paid (Refined) | R | 1 818 620 000 | 2 069 685 000 | 1 783 590 000 | 774 655 000 | 1 344 160 000 |
| EBIT after Royalty (Refined) | R | 18 454 380 000 | 20 866 315 000 | 17 316 410 000 | 6 599 345 000 | 12 560 840 000 |
| EBIT/Revenue after Royalty (Refined) | % | 46.89% | 44.43% | 33.88% | 17.86% | 27.10% |

Source: See Appendix 1B

For the purpose of detailed analysis, the calculations in this table were split-up and grouped as EBIT before and after royalty payment; and Profitability before and after royalty payment.

5.4.2.1 EBIT and Profitability before and after royalty analysis

Table 5.4- 3: EBIT before and after royalty payment for Refined PGM production

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT (Refined) before royalty - EBIT (Refined) after royalty | R | 1 818 620 000 | 2 069 685 000 | 1 783 590 000 | 774 655 000 | 1 344 160 000 |

Expressed graphically as,

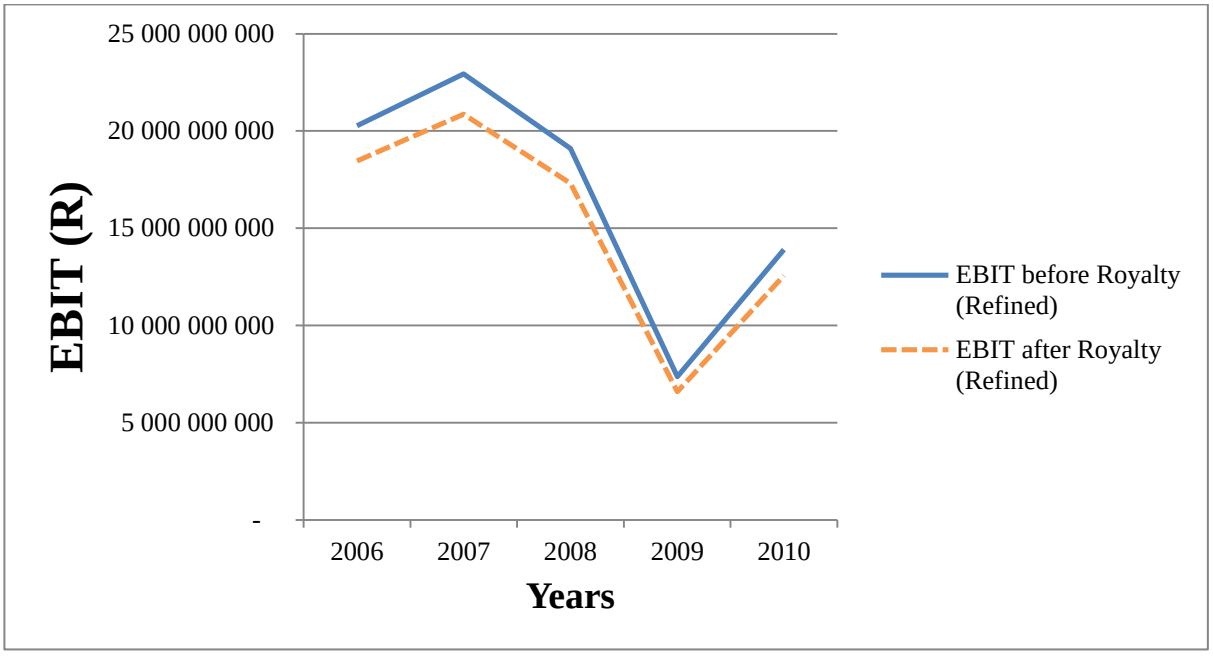


Figure 5.4-1: EBIT before and after royalty payment for Refined PGM production

Table 5.4-4: EBIT/Revenue (Profitability) before and after royalty payment for Refined PGM production

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Profitability (Refined) before Royalty - Profitability (Refined) after Royalty | % | 4.62% | 4.41% | 3.49% | 2.10% | 2.90% |

Expressed graphically as,

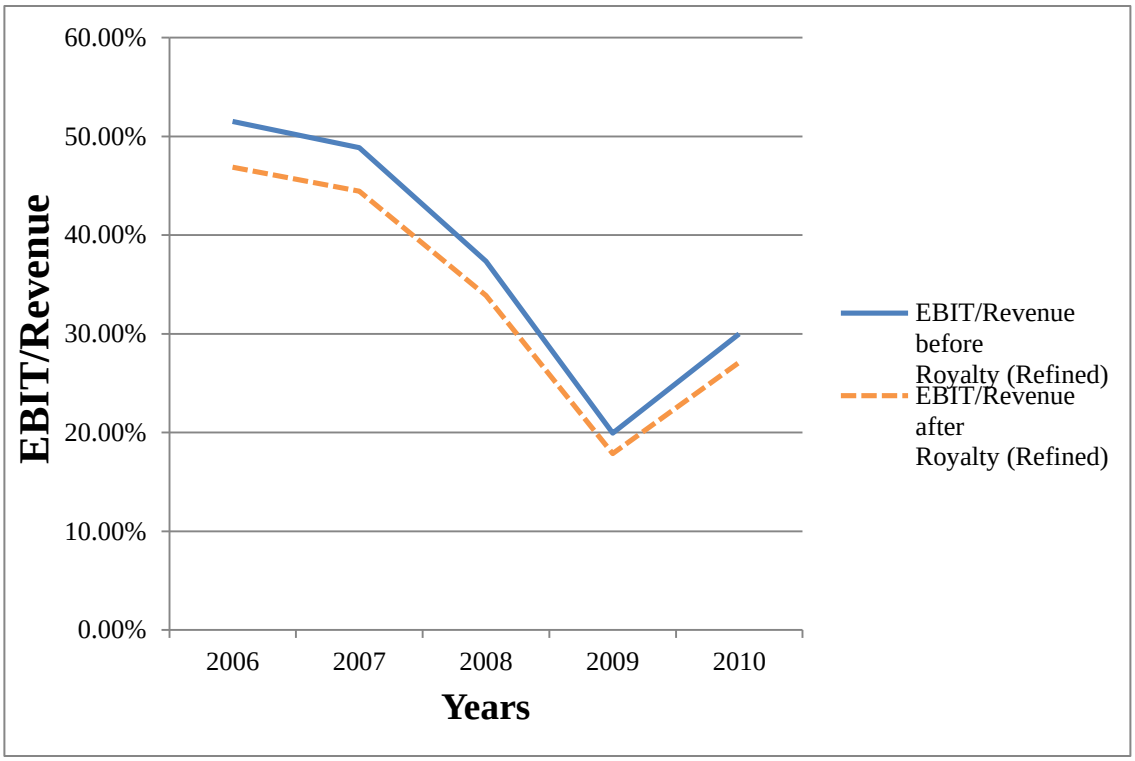


Figure 5.4-2: Profitability before and after royalty payment for Refined PGM production

Comments:

Under the MPRRA, the calculation of the royalty rate is achieved based on varying profitability levels of the mines for each mineral product transferred. As observed from the results above, the magnitude of royalty rate (which reduced EBITs) flowed in tandem with the high or low magnitude of profits received in that year. In years 2006 to 2008, which had good profits, the royalty rates were high, but in year 2009 with depressed profit, the royalty rate was very low. In the Figures 5.4-1 and 5.4-2, it can also be observed that the gap between EBITs before and after the royalty payments, as well as the gap between profitability before and after the royalty payments, was greater in the good profit years but decreasingly diminished with movements into the year with bad profit.

## 5.5 GROUP ANALYSIS – UNREFINED PGM PRODUCTION

### 5.5.1 Discussions

Table 5.5-1: Group Analysis – Unrefined PGM production (Base case)

| ANGLO AMERICAN PLATINUM (Group analysis- Unrefined PGM) Base case | | | | | | |
|---|---|---|---|---|---|---|
| | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
| Tonnes milled | t | 43 792 000 | 41 563 000 | 42 611 000 | 43 114 000 | 42 242 000 |
| Head grade | g/t | 3.81 | 3.63 | 3.36 | 3.31 | 3.23 |
| recovery | | 98% | 98% | 98% | 98% | 98% |
| Recovered metal | g | 163 510 570 | 147 856 216 | 140 309 501 | 139 853 193 | 133 712 827 |
| Metal in concentrate (Recovered metal) | oz | 5 257 000 | 4 753 699 | 4 511 066 | 4 496 396 | 4 298 978 |
| Prices received (sheet3) | R/oz | 7 114 | 9 200 | 12 863 | 6 211 | 8 689 |
| Gross revenue | R | 37 398 297 039 | 43 734 035 155 | 58 025 846 332 | 27 927 113 530 | 37 353 818 298 |
| Mining costs | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| EBIT before Royalty | R | 24 415 297 039 | 27 609 035 155 | 37 782 846 332 | 8 384 113 530 | 17 434 818 298 |
| EBIT/Revenue before Royalty | % | 65.28% | 63.13% | 65.11% | 30.02% | 46.67% |
| Unrefined Royalty Rate | % | 7.00 | 7.00 | 7.00 | 3.84 | 5.69 |
| Royalty paid | R | 2 617 880 793 | 3 061 382 461 | 4 061 809 243 | 1 071 203 738 | 2 123 971 125 |
| EBIT after Royalty | R | 21 797 416 247 | 24 547 652 694 | 33 721 037 088 | 7 312 909 792 | 15 310 847 174 |
| EBIT/Revenue after Royalty | % | 58.28% | 56.13% | 58.11% | 26.19% | 40.99% |

Source: See Appendix 2A

In the Table 5.5-1,

- Total metal in concentrate production (recovered metal ounces) used, was calculated based on information given on Tonnes milled, Average Head grade stated in the Amplats annual reports and assumed recovery value of 98%, as the exact values of "Anglo Platinum Limited's standard smelting and refining recoveries" could not be accessed;

- Prices for metal in concentrate that was used were drawn from calculated averages of prices received from Kroondal and Marikana mines, which are in JV agreements with Amplats. The prices received for metal in concentrate from these two mines, were calculated using a 'base case' approach as opposed to the "prices received per PGM ounce" stated in Aquarius annual reports (2010, 2009, 2007 and 2006). In the base case approach, each mine's attributable revenue for each mine per year was divided by its attributable metal in concentrate production per year, see Appendix 2B. This assumption was used knowing that Aquarius and Anglo are in joint venture operations at these two mines and Aquarius might not sell concentrates to Amplats at market (fair value) price;
- Operating costs that were attributed to mining and deducted from gross revenue to give 'EBIT before royalty' include mining costs only; and
- For the purpose of calculating proportion of mining costs of price received for refined product based on the work done by Cawood (2011), 'mining costs' only was used as being directly attributed to the mining operation.

### 5.5.2 Data processing and analysis

Table 5.5-2: Calculations for EBIT, EBIT/Revenue (Profitability) before and after royalty, and royalty payment for Unrefined PGM production

| (U) | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT before Royalty (Unrefined) | R | 24 415 297 039 | 27 609 035 155 | 37 782 846 332 | 8 384 113 530 | 17 434 818 298 |
| EBIT/Revenue before Royalty (Unrefined) | % | 65.28% | 63.13% | 65.11% | 30.02% | 46.67% |
| Unrefined Royalty Rate | % | 7.00 | 7.00 | 7.00 | 3.84 | 5.69 |
| Royalty paid (Unrefined) | R | 2 617 880 793 | 3 061 382 461 | 4 061 809 243 | 1 071 203 738 | 2 123 971 125 |
| EBIT after Royalty (Unrefined) | R | 21 797 416 247 | 24 547 652 694 | 33 721 037 088 | 7 312 909 792 | 15 310 847 174 |
| EBIT/Revenue after Royalty (Unrefined) | % | 58.28% | 56.13% | 58.11% | 26.19% | 40.99% |

Source: See Appendix 2C

For the purpose of detailed analysis, the calculations in this table were split-up and grouped as EBIT before and after royalty payment; and Profitability before and after royalty payment.

### 5.5.2.1 EBIT and Profitability before and after royalty analysis

Table 5.5-3: EBIT before and after royalty payment for Unrefined PGM production

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT (Unrefined) Before Royalty - EBIT (Unrefined) after Royalty | R | 2 617 880 793 | 3 061 382 461 | 4 061 809 243 | 1 071 203 738 | 2 123 971 125 |

Expressed graphically as,

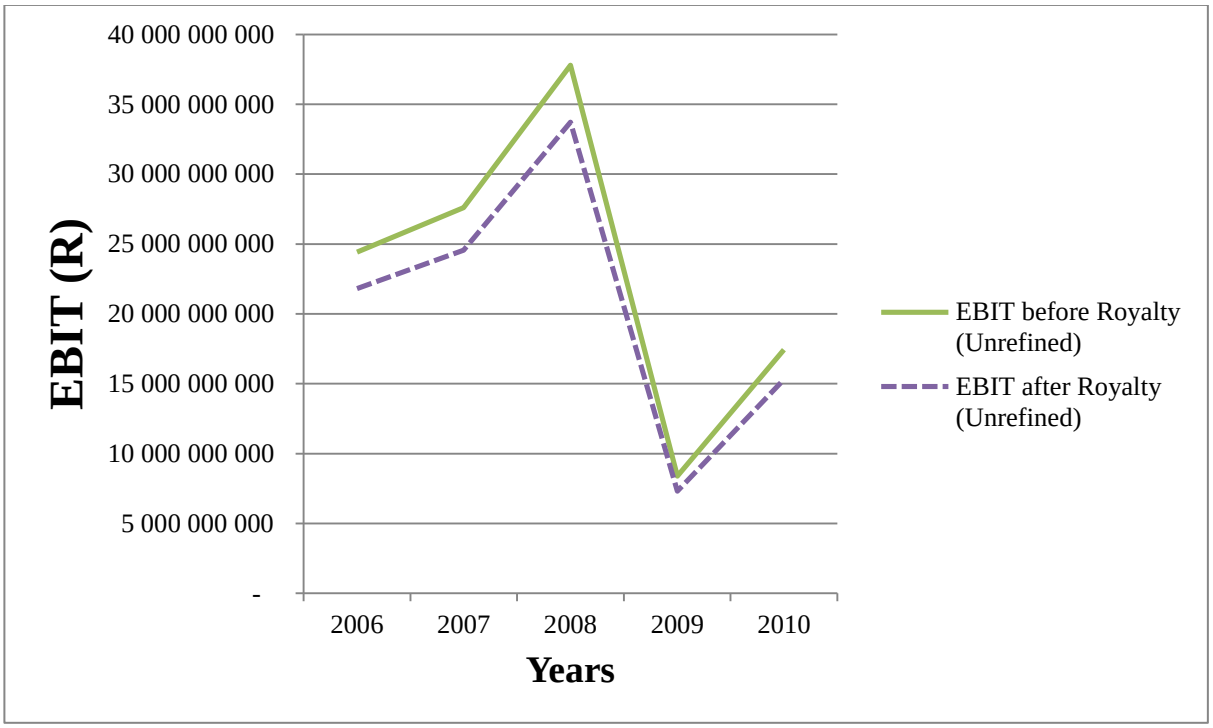


Figure 5.5-1: EBIT before and after royalty payment for Unrefined PGM production

Table 5.5-4: EBIT/Revenue (Profitability) before and after royalty payment for Unrefined PGM production

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Profitability (Unefined) before royalty - Profitablity (Unefined) after royalty | % | 7.00% | 7.00% | 7.00% | 3.84% | 5.69% |

Expressed graphically as,

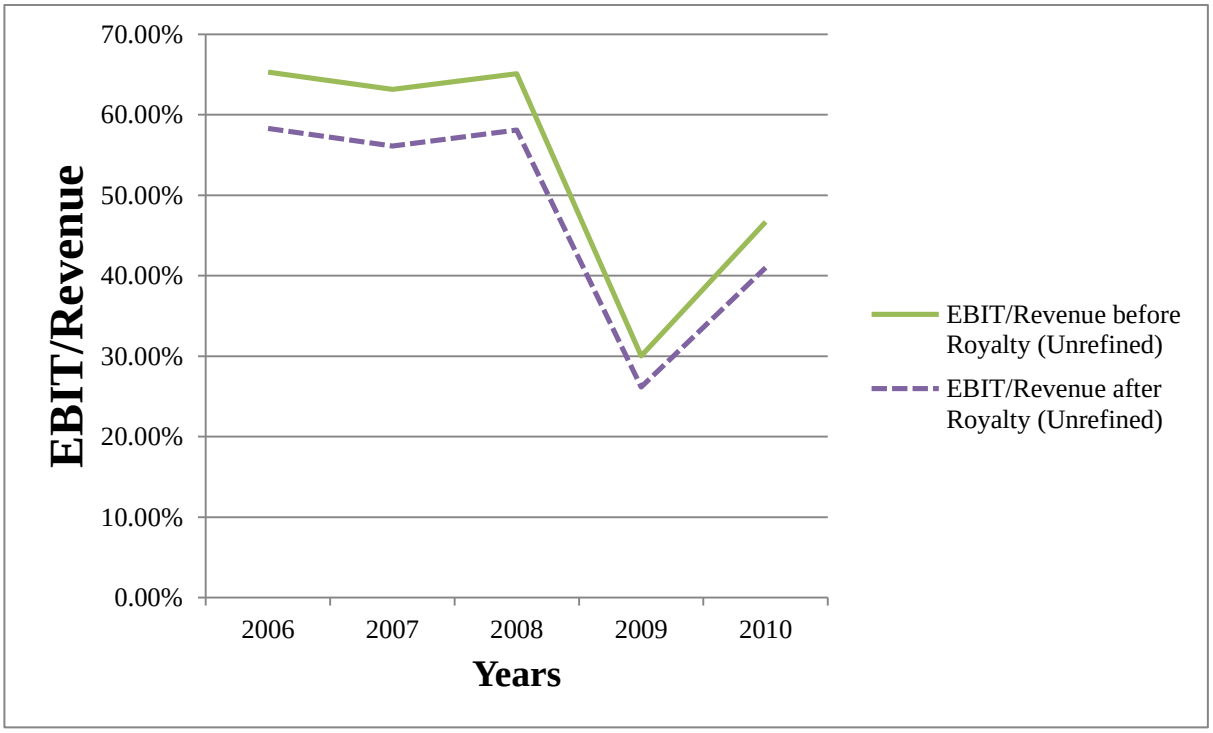


Figure 5.5-2: Profitability before and after royalty payment for Unrefined PGM production

Comments:

As mentioned earlier, under the MPRRA, the calculation of the royalty rate is achieved based on varying profitability levels of the mines for each mineral product transferred. As observed from the results above, the magnitude of royalty rate (which reduced EBITs) varied in accordance with high or low magnitude of profits received

in that year. In years 2006 to 2008, which had very good profits, the maximum royalty rate for unrefined minerals of 7% was charged in those years, but in year 2009 with very depressed profit, the royalty rate was very low. The year 2010, in which profit improved greatly as compared with 2009 results, a high royalty rate was charged. In the Figures 5.5-1 and 5.5-2, it can also be observed that the gap between EBITs before and after the royalty payments, as well as the gap between Profitability before and after the royalty payments, was greater in the good profit years but decreasingly diminished with movements into the year with bad profit.

## 5.6 THE CASE FOR REFINEMENT: COMPARISON BETWEEN REFINED AND UNREFINED PGM PRODUCTION

### 5.6.1 Data processing and analysis

Table 5.6-1: Comparing EBITs, Profitability and royalty savings for Refined and Unrefined PGM production

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT before Royalty: (U) - (R) | R | 4 142 297 039 | 4 673 035 155 | 18 682 846 332 | 1 010 113 530 | 3 529 818 298 |
| Profitability before Royalty: (U) - (R) | % | 13.77% | 14.29% | 27.75% | 10.06% | 16.68% |
| Royalty payment savings: (U) - (R) | R | 799 260 793 | 991 697 461 | 2 278 219 243 | 296 548 738 | 779 811 125 |
| EBIT after Royalty: (U) - (R) | R | 3 343 036 247 | 3 681 337 694 | 16 404 627 088 | 713 564 792 | 2 750 007 174 |
| Profitability after Royalty: (U) - (R) | % | 11.39% | 11.70% | 24.24% | 8.32% | 13.89% |

Source: See Appendix 3

The comparative (Unrefined vs. Refined PGM production) calculations in this table are split-up and grouped for the purpose of detailed evaluation as “Before Royalty”, “After Royalty”, and “Royalty savings” analysis.

### 5.6.2 “Before Royalty” analysis – EBIT and Profitability before royalty

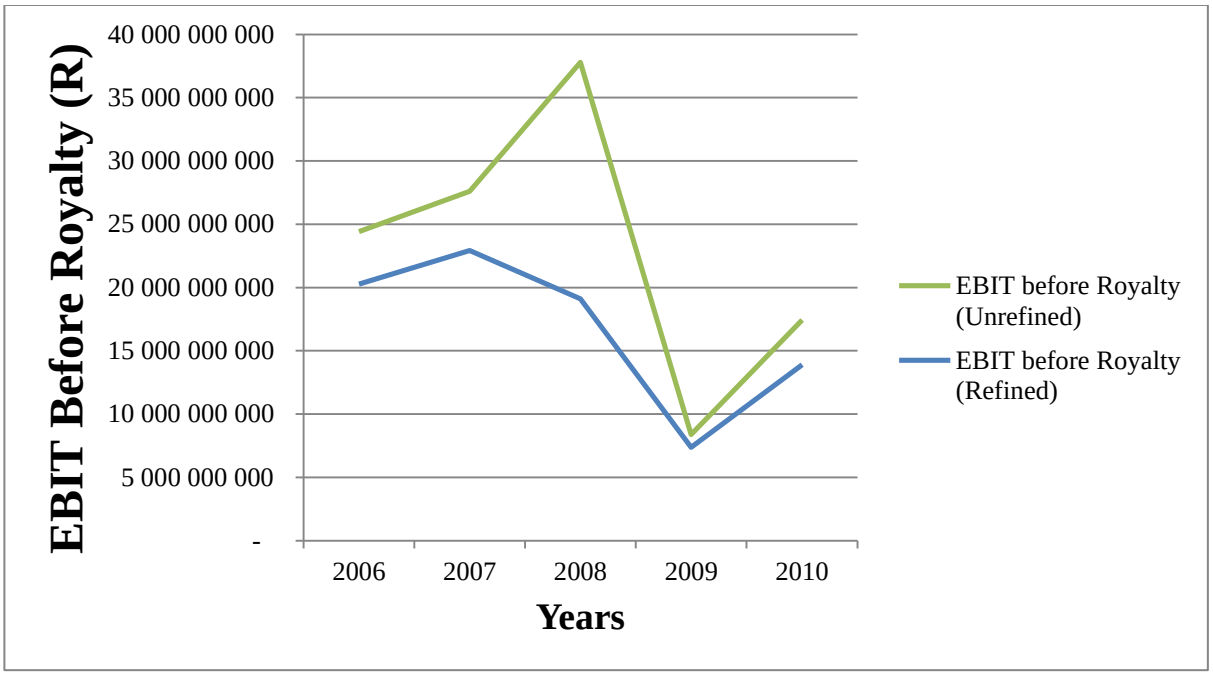


Figure 5.6-1: EBIT before royalty for both Refined and Unrefined PGM production

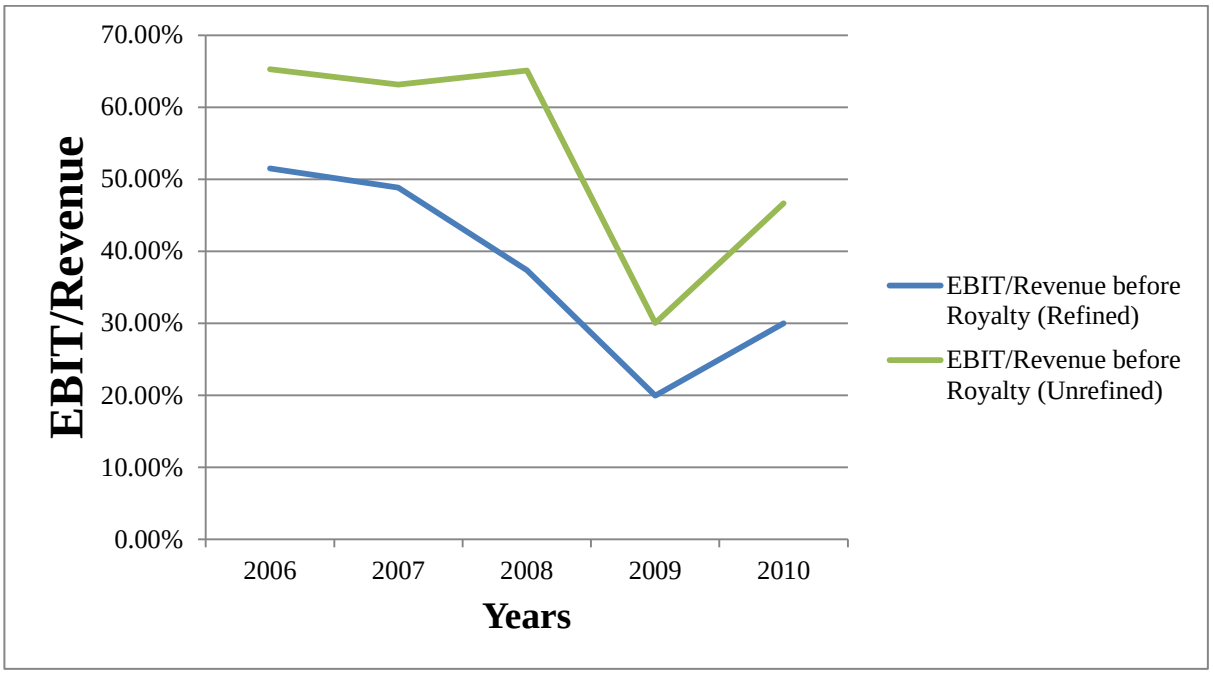


Figure 5.6-2: EBIT/Revenue (Profitability) before royalty for both Refined and Unrefined PGM production

For 2010:

- EBIT before royalty

  Refined: R 13,905,000,000

  Unrefined: R 17,434,818,298

  Difference:

| | | |
|---|---|---|
| EBIT before Royalty: (U) - (R) | R | 3 529 818 298 |

- Profitability before royalty

  Refined: 30.00%

  Unrefined: 46.67%

  Difference:

| | | |
|---|---|---|
| Profitability before Royalty: (U) - (R) | % | 16.68% |

Comments:

From observing the differences in EBITs and Profitability before royalty payments, it can be drawn that in this year, even though the company made significant profits on sale of refined products, it would have been more profitable for the company to sell concentrates as opposed to refined products.

For 2009:

- EBIT before royalty

  Refined: R 7,374,000,000

  Unrefined: R 8,384,113,530

  Difference:

| | | |
|---|---|---|
| EBIT before Royalty: (U) - (R) | R | 1 010 113 530 |

- Profitability before royalty

  Refined: 19.96%

  Unrefined: 30.02%

  Difference:

| | | |
|---|---|---|
| Profitability before Royalty: (U) - (R) | % | 10.06% |

Comments:

From observing the differences in EBITs and Profitability before royalty payments, it can be drawn that in this year, even though the company made significant profits on sale of refined products, it would have been more profitable for the company to sell concentrates as opposed to refined products.

For 2008:

- EBIT before royalty

  Refined: R 19,100,000,000

  Unrefined: R 37,782,846,332

  Difference:

| | | |
|---|---|---|
| EBIT before Royalty: (U) - (R) | R | 18 682 846 332 |

- Profitability before royalty

  Refined: 37.36%

  Unrefined: 65.11%

  Difference:

| | | |
|---|---|---|
| Profitability before Royalty: (U) - (R) | % | 27.75% |

  Comments:

  From observing the differences in EBITs and Profitability before royalty payments, it can be drawn that in this year, even though the company made significant profits on sale of refined products, it would have been more profitable for the company to sell concentrates as opposed to refined products.

For 2007:

- EBIT before royalty

  Refined: R 22,936,000,000

  Unrefined: R 27,609,035,155

  Difference:

| | | |
|---|---|---|
| EBIT before Royalty: (U) - (R) | R | 4 673 035 155 |

- Profitability before royalty

  Refined: 48.84%

  Unrefined: 63.13%

  Difference:

| | | |
|---|---|---|
| Profitability before Royalty: (U) - (R) | % | 14.29% |

  Comments:

  From observing the differences in EBITs and Profitability before royalty payments, it can be drawn that in this year, even though the company made significant profits on sale of refined products, it would have been more profitable for the company to sell concentrates as opposed to refined products.

For 2006:

- EBIT before royalty

  Refined: R 20,273,000,000

  Unrefined: R 24,415,297,039

  Difference:

| | | |
|---|---|---|
| EBIT before Royalty: (U) - (R) | R | 4 142 297 039 |

- Profitability before royalty

  Refined: 51.51%

  Unrefined: 65.28%

  Difference:

| | | |
|---|---|---|
| Profitability before Royalty: (U) - (R) | % | 13.77% |

Comments:

From observing the differences in EBITs and Profitability before and after royalty payments, it can be drawn that in this year, even though the company made significant profits on sale of refined products, it would have been more profitable for the company to sell concentrates as opposed to refined products.

### 5.6.3 "After Royalty" Analysis

5.6.3.1 EBIT after royalty analysis

Table 5.6- 2: Difference between EBIT after royalty of Refined and Unrefined PGM production

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT after Royalty: (U) - (R) | R | 3 343 036 247 | 3 681 337 694 | 16 404 627 088 | 713 564 792 | 2 750 007 174 |

Expressed graphically as,

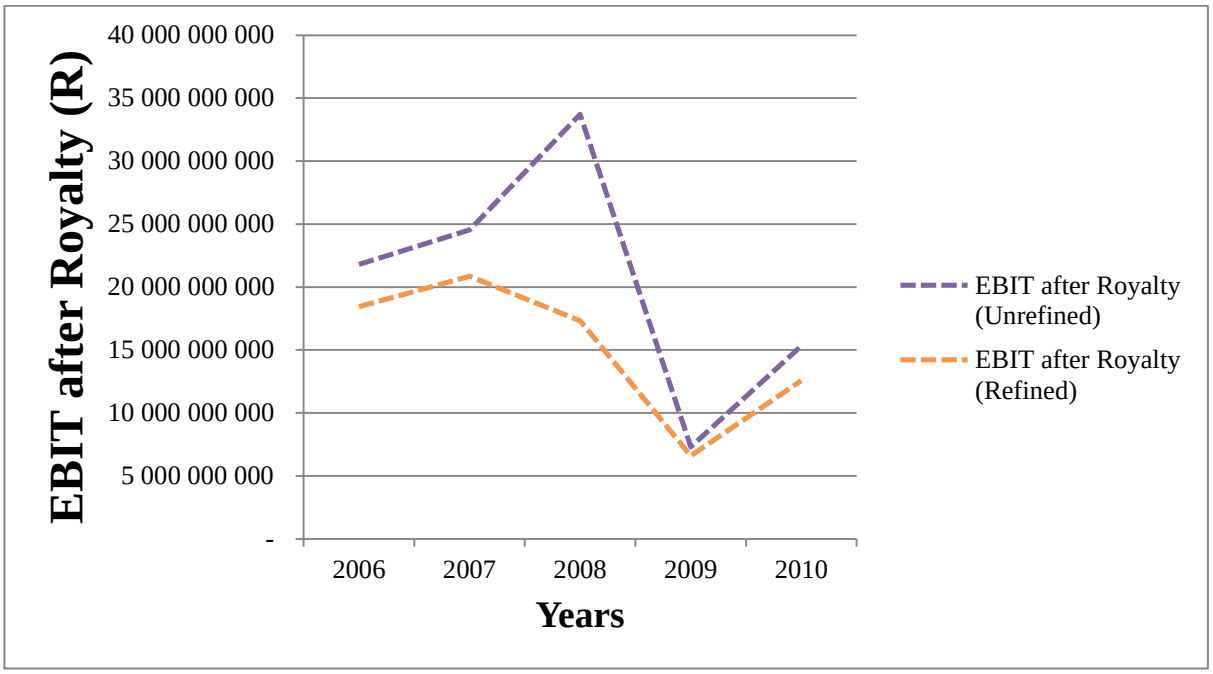


Figure 5.6-3: EBIT after royalty for both Refined and Unrefined PGM production

Comments:

In the years from 2006 to 2010, even after royalty payments, the EBIT after royalty payments (Unrefined) was on the average largely greater than EBIT after royalty payments (refined). This indicates that even with the incentive provisions of the MPRRA, it was more profitable for the company to sell only concentrates.

5.6.3.2 Profitability after royalty Analysis

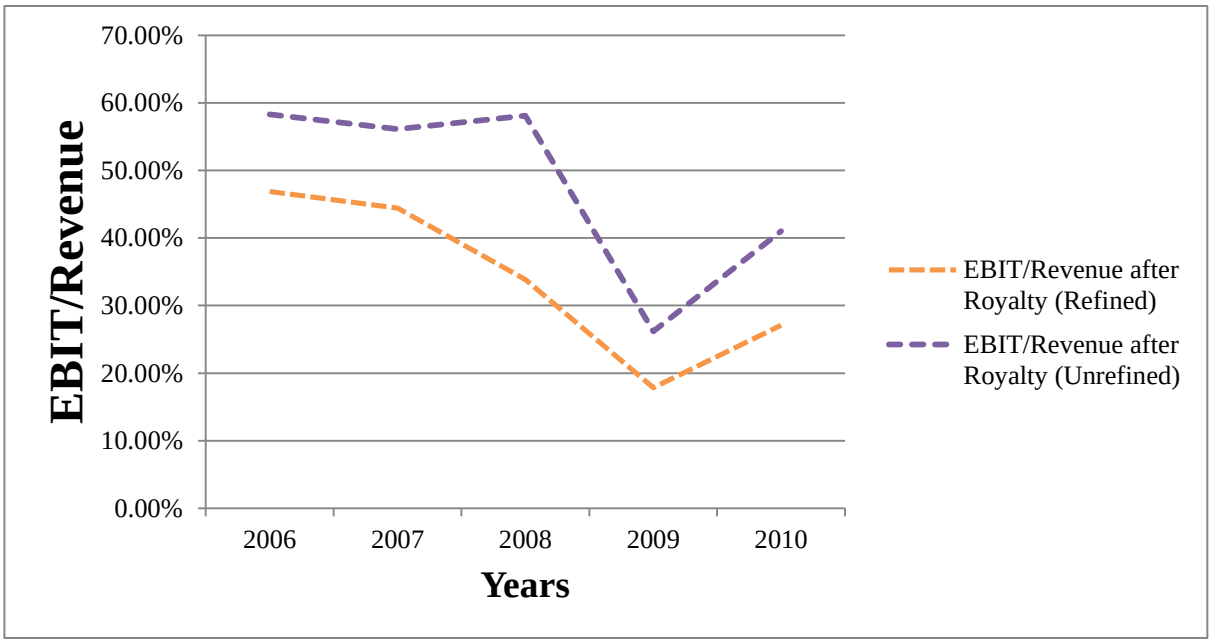


Figure 5.6-4: Profitability after royalty for both Refined and Unrefined PGM production

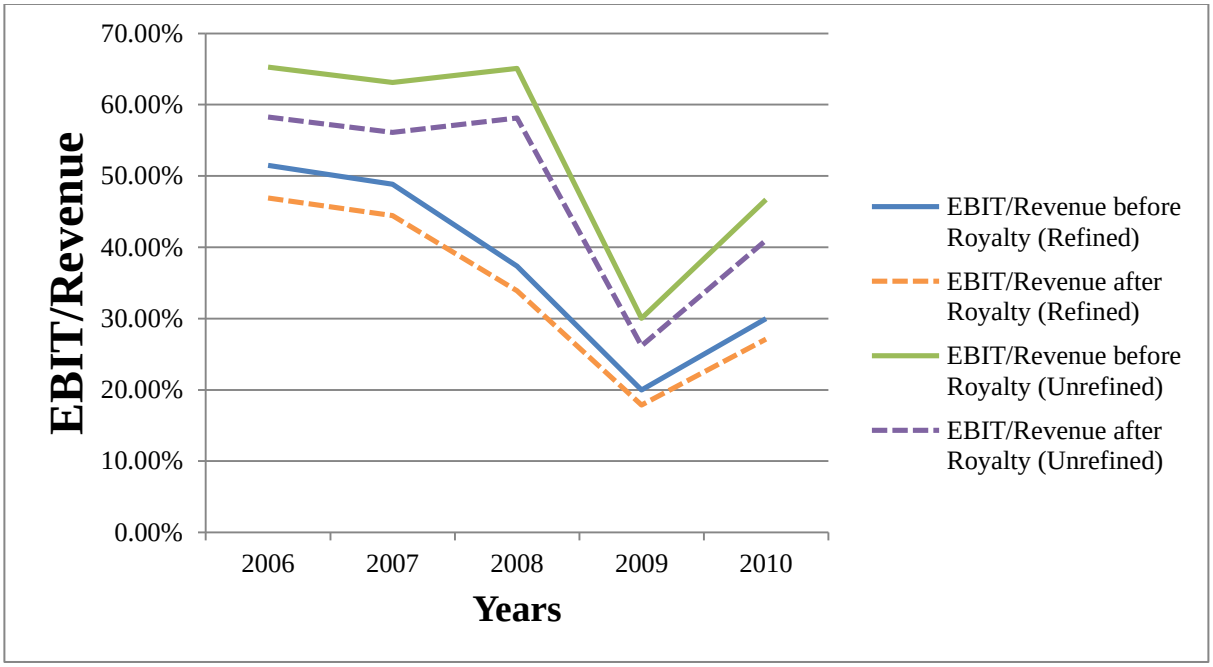


Figure 5.6-5: Profitability before and after royalty for both Refined and Unrefined PGM production

For 2010:

- Profitability after royalty

  Refined: 27.10%

  Unrefined: 40.99%

  Difference:

| | | |
|---|---|---|
| Profitability after Royalty: (U) - (R) | % | 13.89% |

Comments:

As observed, when comparing the profitability after royalty payments of both refined and unrefined, it can be drawn that in this year, even after royalty payments, it is more profitable for the company to sell concentrates as opposed to refined products.

Figure 5.6-5 shows the effect of royalty payment on profitability (refined) and profitability (unrefined)', being represented as the difference between profitability before and after royalty payment. Comparing the behaviour of both production plans, it however suggests that unrefined production pays a higher penalty for royalty payment. This is indicated by profitability difference for unrefined production, which was 5.69% as compared to that of refined production, which was 2.90%.

For 2009:

- Profitability after Royalty

  Refined: 17.86%

  Unrefined: 26.19%

  Difference:

| | | |
|---|---|---|
| Profitability after Royalty: (U) - (R) | % | 8.32% |

Comments:

As observed, when comparing the profitability after royalty payments of both refined and unrefined, it can be drawn that in this year, even after royalty payments, it is more profitable for the company to sell concentrates as opposed to refined products.

Figure 5.6-5 shows the effect of royalty payment on profitability (refined) and profitability (unrefined), being represented as the difference between profitability before and after royalty payment. Comparing the behaviour of both production plans, it however suggests that unrefined production pays a higher penalty for royalty payment. This is indicated by profitability difference for unrefined production, which was 3.84% as compared to that of refined production, which was 2.10%.

For 2008:

- Profitability after Royalty

  Refined: 33.88%

  Unrefined: 58.11%

  Difference:

| | | |
|---|---|---|
| Profitability after Royalty: (U) - (R) | % | 24.24% |

Comments:

As observed, when comparing the profitability after royalty payments of both refined and unrefined, it can be drawn that in this year, even after royalty payments, it is more profitable for the company to sell concentrates as opposed to refined products.

Figure 5.6-5 shows the effect of royalty payment on profitability (refined) and profitability (unrefined), being represented as the difference between profitability before and after royalty payment. Comparing the behaviour of both

production plans, it however suggests that unrefined production pays a higher penalty for royalty payment. This is indicated by profitability difference for unrefined production, which was 7.00% as compared to that of refined production, which was 3.49%.

For 2007:

- Profitability after Royalty

  Refined: 44.43%

  Unrefined: 56.13%

  Difference:

| | | |
|---|---|---|
| Profitability after Royalty: (U) - (R) | % | 11.70% |

Comments:

As observed, when comparing the profitability after royalty payments of both refined and unrefined, it can be drawn that in this year, even after royalty payments, it is more profitable for the company to sell concentrates as opposed to refined products.

Figure 5.6-5 shows the effect of royalty payment on profitability (refined) and profitability (unrefined), being represented as the difference between profitability before and after royalty payment. Comparing the behaviour of both production plans, it however suggests that unrefined production pays a higher penalty for royalty payment. This is indicated by profitability difference for unrefined production, which was 7.00% as compared to that of refined production, which was 4.41%.

For 2006:

- Profitability after Royalty

  Refined: 46.89%

  Unrefined: 58.28%

Difference:

| | | |
|---|---|---|
| Profitability after Royalty:<br>(U) - (R) | % | 11.39% |

Comments:

As observed, when comparing the profitability after royalty payments of both refined and unrefined, it can be drawn that in this year, even after royalty payments, it is more profitable for the company to sell concentrates as opposed to refined products.

Figure 5.6-5 shows the effect of royalty payment on profitability (refined) and profitability (unrefined), being represented as the difference between profitability before and after royalty payment. Comparing the behaviour of both production plans, it however suggests that unrefined production pays a higher penalty for royalty payment. This is indicated by profitability difference for unrefined production, which was 7.00% as compared to that of refined production, which was 4.62%.

### 5.6.4 Royalty savings analysis, Value added or not

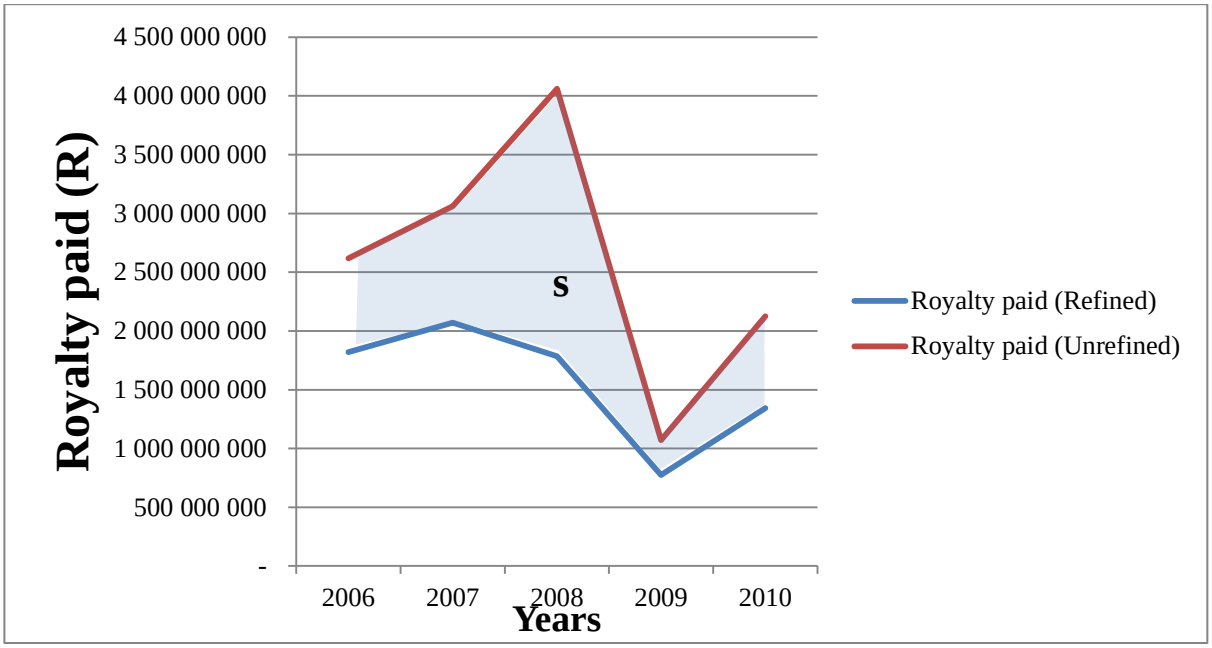


Figure 5.6-6: Royalty payments for both Refined and Unrefined PGM production

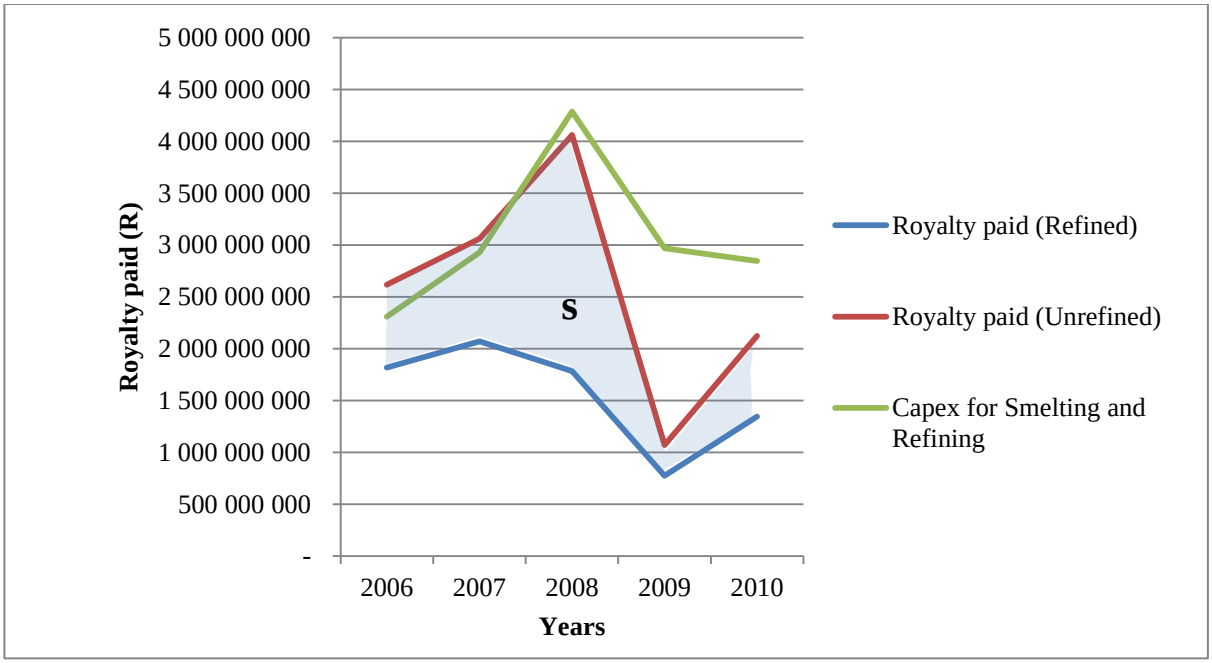


Figure 5.6-7: Effect of smelting and refining capex on area depicting royalty payment savings

For 2010:

- Royalty paid

  Refined: R 1,344,160,000

  Unrefined: R 2,123,971,125

  Difference:

| | | |
|---|---|---|
| Royalty payment savings: (U) - (R) | R | 779 811 125 |

  Comments:

  From the above, based on the beneficiation incentives provided in the MPRRA, there is a significant amount that would have accrued if refining took place in that year. However, this result was obtained because smelting and refining (S & R) capex for that year was not factored in. The S & R capex for 2010:

| | | |
|---|---|---|
| Capex for Smelting and Refining | R | 1 502 000 000 |

  On addition of S & R capex to refinement cost, the royalty payment savings of R779,811,125 is wiped out, as the savings can only cater for about half of the capex requirement for that year. Therefore, it can be drawn that in this year, on application of royalty formula for refined products, it was a disincentive with no value added. As shown in Figure 5.6-7, the S & R capex falls outside the royalty payment savings area (S).

For 2009:

- Royalty paid

  Refined: R 774,655,000

  Unrefined: R 1,071,203,738

  Difference:

| | | |
|---|---|---|
| Royalty payment savings: (U) - (R) | R | 296 548 738 |

Comments:

From the above, based on the beneficiation incentive provided in the MPRRA, there is a significant amount that would have accrued if refining took place in that year. However, this result was obtained because S & R capex for that year was not factored in. The S & R capex for 2009:

| | | |
|---|---|---|
| Capex for Smelting and Refining | R | 2 194 000 000 |

On addition of S & R capex to refinement cost, the royalty payment savings of R296,548,738 is wiped out, as the savings cannot cater for any significant proportion of the capex requirement for that year. Therefore, it can be drawn that in this year, on application of royalty formula for refined products, it was a disincentive with no value added. As shown in Figure 5.6-7, the S & R capex falls outside the royalty payment savings area (S).

For 2008:

- Royalty paid

  Refined: R 1,783,590,000

  Unrefined: R 4,061,809,243

  Difference:

| | | |
|---|---|---|
| Royalty payment savings:<br>(U) - (R) | R | 2 278 219 243 |

Comments:

From the above, based on the beneficiation incentive provided in the MPRRA, there is a very significant amount that would have accrued if refining took place in that year. However, this result was obtained because S & R capex for that year was not factored in. The S & R capex for 2008:

| | | |
|---|---|---|
| Capex for Smelting and Refining | R | 2 504 000 000 |

On addition of S & R capex to refinement cost, the royalty payment savings of R2,278,219,243 is wiped out, although, it can be noted that the savings catered

for a very significant proportion of the capex requirement for that year. Therefore, it can be drawn that in this year, on application of royalty formula for refined products, it was a disincentive with not much value added. As shown in Figure 5.6-7, the S & R capex falls slightly outside the royalty payment savings area (S).

For 2007:

- Royalty paid

  Refined: R 2,069,685,000

  Unrefined: R 3,061,382,461

  Difference:

| | | |
|---|---|---|
| Royalty payment savings:<br>(U) - (R) | R | 991 697 461 |

Comments:

From the above, based on the beneficiation incentive provided in the MPRRA, there is a very significant amount that would have accrued if refining was taken on in that year. However, this result was obtained because S & R capex for that year was not factored in. The S & R capex for 2007:

| | | |
|---|---|---|
| Capex for Smelting and Refining | R | 860 000 000 |

On addition of S & R capex to refinement cost, the royalty payment savings of R991,697,461 caters for all the capex requirement for that year, leaving a credit balance of R131,697,461. Therefore, it can be drawn that in this year, on application of royalty formula for refined products, it was an incentive with significant value added. As shown in Figure 5.6-7, the S & R capex falls within the royalty payment savings area (S).

For 2006:

- Royalty paid

  Refined: R 1,818,620,000

Unrefined: R 2,617,880,793

Difference:

| | | |
|---|---|---|
| Royalty payment savings:<br>(U) - (R) | R | 799 260 793 |

Comments:

From the above, based on the beneficiation incentive provided in the MPRRA, there is a significant amount that would have accrued if refining was taken on in that year. However, this result was obtained because S & R capex for that year was not factored in. The S & R capex for 2006:

| | | |
|---|---|---|
| Capex for Smelting and Refining | R | 489 000 000 |

On addition of S & R capex to refinement cost, the royalty payment savings of R799,260,793 caters for all the capex requirements for that year, leaving a credit balance of R310,260,793. Therefore, it can be drawn that in this year, on application of royalty formula for refined products, it was an incentive with significant value added. As shown in Figure 5.6-7, the S & R capex falls well within the royalty payment savings area (S).

### 5.6.5 Effect of conservative S & R capital expenditure on royalty savings, value added or not

In section 5.6.4, the effect of S & R capex on the royalty savings that accrued to the miner-turned-refiner was based on actual data obtained from the Anglo annual reports. However, in this section, another scenario is portrayed in which the substantial capital costs expensed in years 2008, 2009 and 2010 were reduced and the same capex value was used for those years. This scenario analysis was carried out to ascertain what the effect would be on royalty savings (incurred when refined royalty assessment is done instead of unrefined assessment), if the producer decided to be conservative on its S & R capital expenditure. The capex value used for years 2008 to

2010, was obtained by averaging the actual capex values for years 2006, 2007, 2009 and 2010, which gave a value of R1,261,250,000. See Table 5.6-3 below.

Table 5.6- 3: Average S & R capex value made constant in years 2008, 2009 and 2010

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Capex for Smelting and Refining | R | 489 000 000 | 860 000 000 | 1 261 250 000 | 1 261 250 000 | 1 261 250 000 |

The effect of the above on royalty savings is expressed graphically as,

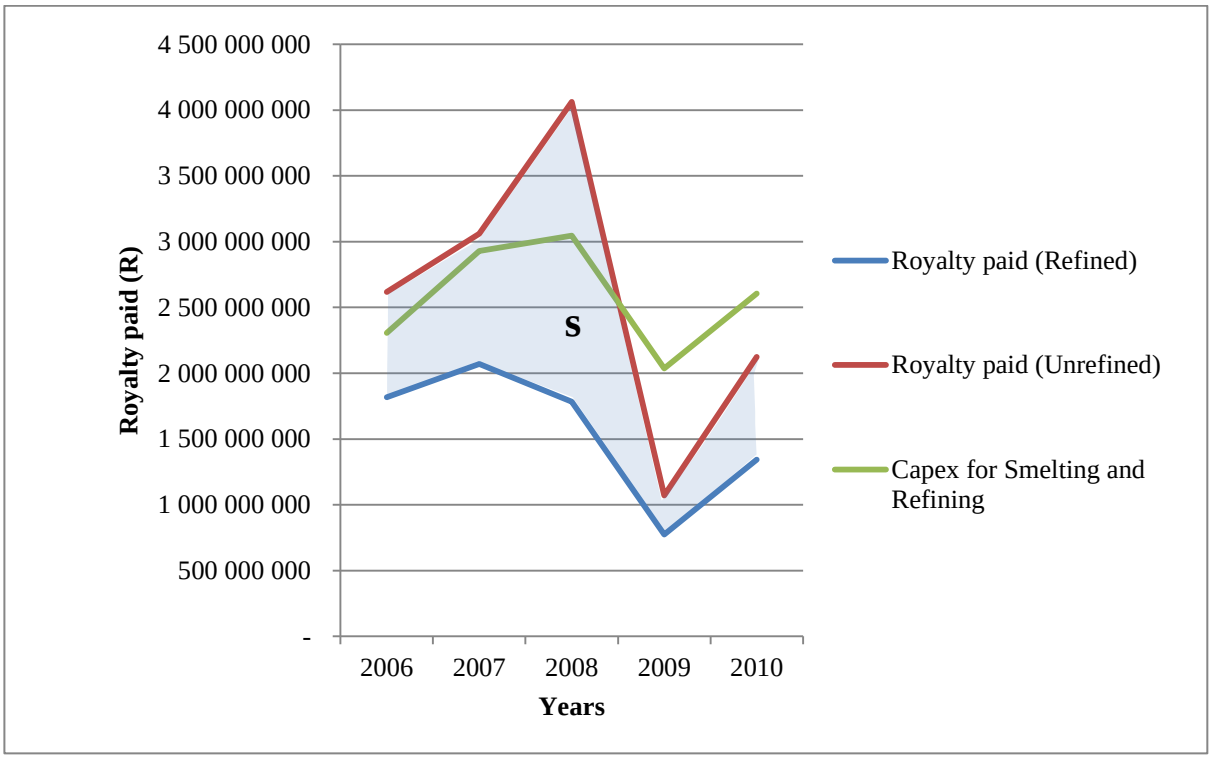


Figure 5.6- 8: Effect of conservative smelting and refining capex on royalty payment savings

From Figure 5.6-8, it can be observed that in years 2006, 2007 and 2008, the S & R capex fell within the royalty savings area S. This implies that in years 2006 to 2008, significant value would have been added to the miner-turned-refiner's financial

position, provided this producer had moderately incurred S & R capital costs. However, for years 2009 and 2010 even with conservative capital expenditure, capex fell outside the royalty savings area. This implied that even with moderate capital expensing, the MPRR regime's reduced royalty rate for refined production would not have been an incentive in years 2009 and 2010 for the miner-turned-refiner. From this analysis, it can be suggested that if the producer has control on its cost of production, the MPRR regime's beneficiation incentive would encourage miners to become refiners in good profit years but would be a disincentive in bad profit years.

## 5.7 DATA PROCESSING AND ANALYSIS OF PROPORTION OF REFINEMENT COST OF SALES PRICE

Table 5.7- 1: Calculation – Proportions of concentrate and refinement costs, of sales price

| Cost ratio | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Cm | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| Cr | R | 6 100 000 000 | 7 900 000 000 | 11 775 000 000 | 10 030 000 000 | 12 528 000 000 |
| Total cost (Ct) | R | 19 083 000 000 | 24 025 000 000 | 32 018 000 000 | 29 573 000 000 | 32 447 000 000 |
| Percentage of Cm of Ct | % | 68% | 67% | 63% | 66% | 61% |
| Percentage of Cr of Ct | % | 33% | 33% | 37% | 34% | 39% |
| Proportion of costs of Sales Price | | | | | | |
| Gross Revenue as a proxy of Sales Price | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| Percentage of Cm of Gross Revenue (Sales price) | % | 33% | 34% | 40% | 53% | 43% |
| percentage of Cr of Gross Revenue (Sales price) | % | 15% | 17% | 23% | 27% | 27% |

Source: See Appendix 4A

Table 5.7-2: Proportion of refinement cost of sales price

| Cost ratio | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Cm | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| Cr | R | 6 100 000 000 | 7 900 000 000 | 11 775 000 000 | 10 030 000 000 | 12 528 000 000 |
| Total cost (Ct) | R | 19 083 000 000 | 24 025 000 000 | 32 018 000 000 | 29 573 000 000 | 32 447 000 000 |
| Proportion of costs of Sales Price | | | | | | |
| Gross Revenue as a proxy Sales Price | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| percentage of Cr of Gross Revenue (Sales price) | % | 15% | 17% | 23% | 27% | 27% |

Source: See Appendix 4B

In Tables 5.7-1 and 5.7-2 above, gross revenue was used as a proxy for sales price due to the fact that adequate information as regards unit sales price and total volume of PGM sold (which generated the gross revenue) could not be obtained as at the time of carrying out this analysis. Also, total refinement cost (Cr) was also used as a proxy for unit cost price of refinement because of lack of sufficient supporting information. Thus, since the gross revenue and total refinement cost both have a common denominator – volume, this supported the use of these proxy values to ascertain proportion of sales price that can be attributed to refinement cost.

The analysis carried out in this section is based on the model drawn up by Cawood (2011) which is based on his interpretation of Bradley's approach. In chapter three, observations drawn from Figures 3.3-3, 3.3-4 and 3.3-5 (Cawood's model) indicated that significant value is added if refining cost is 10% of final sales price, little value is added if refining cost is 20% final sales price and no value is added if refining cost is 30% of sales price received. Hence, it was concluded that if refining costs are above 20% of sales price, adding on refining facility would be of detrimental value to the miner.

From the econometric analysis carried out in this section (see Table 5.7-2), it was found that in 2006 and 2007, refinement costs were 15% and 17% of sales price, respectively. Based on conclusions stated in the previous paragraph, it can be drawn that in those years, with the incentive provisions of the MPRRA some amount of value would have been added to a miner that took on refining processes. However, from 2008 to 2010, based on the values given of proportion of refinement costs, which were all above 20% but less than 30%, little value would have been added to the miner-turned-refiner.

These results – Total refinement costs (Cr) – were based on refinement operating costs only, with no S & R capex included. When S & R capex was included for all the years as seen in Table 5.7-3, it can be observed that the proportion of refinement costs of sales price increased above the values presented initially. With these new values for refinement costs, it can be observed that value is still added in the years 2006 and 2007, although not substantial in size and little or no value is added in the years 2008 to 2010.

Table 5.7- 3: Effect of S & R capex on proportion of refinement cost of sales price

| Cost ratio | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Purchased metals | R | 3 947 000 000 | 5 539 000 000 | 8 999 000 000 | 6 689 000 000 | 9 215 000 000 |
| Smelting costs | R | 1 238 000 000 | 1 314 000 000 | 1 625 000 000 | 1 881 000 000 | 1 846 000 000 |
| Treatment and Refining costs | R | 915 000 000 | 1 047 000 000 | 1 151 000 000 | 1 460 000 000 | 1 467 000 000 |
| S & R Capex | R | 489 000 000 | 860 000 000 | 2 504 000 000 | 2 194 000 000 | 1 502 000 000 |
| Cr | R | 6 589 000 000 | 8 760 000 000 | 14 279 000 000 | 12 224 000 000 | 14 030 000 000 |
| Proportion of costs of Sales Price | | | | | | |
| Gross Revenue as a proxy Sales Price | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| Percentage of Cr of Gross Revenue (Sales price) | % | 17% | 19% | 28% | 33% | 30% |

Source: See Appendix 4C

## 5.8 CONCLUSION

In summary, after establishing the PGM sector as the focus for the econometric analysis of this project, the biggest global player in this sector – Anglo American Platinum Limited was the South African platinum mining company chosen for data-use, processing and analysis. Its EBITs, profitability ratios and beneficiation costs (as percentages of sales price) data were evaluated and the methodology (conclusions from Bradley and Cawood's models) in chapter three was applied to these data.

In conclusion, from the results obtained in the tables above coupled with the observations from the sections on analysis of royalty savings and proportion of refinement cost of sales price, on an above-average assessment, it can be concluded that if the MPRRA's reduced rate provision for refined products is the only incentive given to motivate miners to become refiners, this is not substantial enough. Therefore, the fiscal policy objectives of the MPRRA to foster mineral beneficiation by allowing for reduced royalty rate for refined minerals, viewing from the perspective of a representative mining company, would not be achieved.

The next chapter is a summary of all findings in this report and statement of the conclusions drawn that answer the question raised in this report, which sought to find out if the new South African mineral royalty formulae, would encourage many more mining companies to become refiners of minerals, thereby satisfying the South African government's beneficiation (industrial) and economic objectives. Some recommendations will be given, which proposes areas of further research needed to ensure that the beneficiation objective of the MPRR regime would be realized.

# CHAPTER SIX

## CONCLUSION AND RECOMMENDATION

All through history, it has been observed that the growth of many towns and states world-wide has originated from the minerals industry. This sector has contributed greatly to the economic growth, employment opportunities, further mineral development, provision of requisite infrastructure as well as other spin-off benefits to the economy of host jurisdictions. This report took a general look at mineral fiscal policies used to generate funds needed by the government to provide the above-mentioned benefits to its citizens. Also, to incentivise the mining companies, it was settled that governments must ensure that the mineral operating, fiscal and regulatory environment of their jurisdictions is stable and efficient. This would allow for the attraction of more direct investment from mining companies as well as increase tax revenue collected from mining companies (PWC, 2010).

Narrowing down to the South African context, its policy-makers have borne the stability and efficiency principles in mind when revising and designing their fiscal and regulatory policies. With South Africa seeking to use the new MPRRA as a way of ensuring that the mineral sector facilitates the diversification of her economy by encouraging the existence of more refining facilities from extractive ones, its design was not left out of incorporating the above principles. After extensive discussions and consultations, the structure – royalty base and rate, was made to achieve an equitable balance, as much as possible.

The main focus of this research project was to assess whether the new South African Mineral and Petroleum Resources Royalty regime's provision of beneficiation (refining) incentive would facilitate further mineral development by encouraging mining companies to move-up the value-chain to become refiners.

A South African platinum company within the PGM sector was used for the project's assessment so as to answer its problem question. The PGM sector was settled for because its contribution was to a large extent the backbone of government revenues of the recent boom, as at 2010 (PWC, 2010).

The next section comprises of the summary of all information obtained in order to answer the problem question of this research report.

## 6.1 SUMMARY OF FINDINGS

### 6.1.1 Chapter one: Background, Literature Review and Aims of Research

This chapter supported the fact that host governments of mineral-rich economies have rightful claim to benefit from mining activities. It showed that they have used fiscal instruments over time to extract a fair share of mineral wealth, which is then used to fund social-economic responsibilities as well as to facilitate or discourage various kinds of private sector decisions.

In this chapter, it was shown that it was justified to apply discriminatory taxation to the mineral sector as different from all sectors of the economy, because of the unique characteristics of minerals. The history that governed the evolution of mining fiscal systems was covered, indicating that mineral-rich developing countries had been revising their fiscal systems to capture greater share in mineral wealth and also as a form of development strategy for the encouragement of beneficiation and establishment of economic linkages from mineral development. The different types of mining taxation systems in existence were mentioned with particular emphasis on the use of mineral royalties. Mineral royalty was defined as being a just and necessary compensatory charge for state-owned resources, which can be used up for the

realization of increased economic growth and development of mineral-rich jurisdictions. The five (5) broad categories of royalties were also explained briefly. Sweden and Finland were indicated as country examples who understood that mineral resource dependence could not guarantee sustained and long-term growth and development of their jurisdictions, and hitherto, used their policies (including fiscal systems for capturing of mineral wealth) as a basis for creation of other alternative sources of exports and industrialization. The mineral royalty policy (systems) of some other countries – Ghana, Mongolia, NWT (Canada) and Western Australia – that have custodianship of minerals and whose royalty systems are similar to South Africa's *ad valorem*/hybrid royalty type, were also examined. They were assessed to ascertain if their systems had provisions for further mineral beneficiation, and if so, what success or failure stories could South Africa's MPRRA draw from them. However, the constraint of this section, was the lack of access to up-to-date detailed information on the royalty regimes of many countries especially as regards provisions to facilitate beneficiation, the analysis of the regimes and what the impact of regimes have been on investment and operations.

It was identified that Ghana has an *ad valorem*, profitability dependent, sliding-scale system. It is similar to South Africa's MPRR regime because it places no specific royalty rate on minerals and its profitability dependence. However, it is dissimilar in that it has no beneficiation provisions. According to Akabzaa (2009), the Mining Code governing Ghana's royalty regime "lacks specific provisions that encourage mining companies to foster backward and forward linkages between mining and other sectors of the local economy, which could spur broader national economic development". The incentives for investment in beneficiation facilities lie in taking advantage of the industrial free zone facility to produce beneficiated products and other industrial sector policies (Mine Ghana Investment, 2010). Mongolia introduced a new surtax royalty which became applicable from January 1, 2011. The new surtax royalty is close to South Africa's MPRR regime because it includes provisions to encourage mining companies to engage in value-added activities, as the rates vary

depending on the type of minerals, their market prices and their degree of processing and are not charged on any minerals below a certain threshold market price per mineral type. However, because it was at a fledgling state as at the time of this report, it was difficult to test if many mining companies have been encouraged to engage in value-addition activities through its provisions. Northwest Territories (Canada) has a sliding-scale profit-based royalty regime with mineral processing incentives inclusive and Western Australia has both unit-based and *ad valorem* royalty systems. WA's *ad valorem* system is profitability dependent and charges lower royalties on value-added mineral products so as to encourage local processing.

Furthermore, as regards the South African context, it was stated in this chapter that the collection of mineral royalties (which constituted the second most important source of income for SA), had been in existence since 1878. It also mentioned that the main purpose of the current Royalty Act and stated that it was initially to come into force by 2009 but eventually came into force in 2010. The MPRRA stipulates an *ad valorem*, sliding-scale formula method of charging royalties, which places no specific rate for any minerals, acknowledges profitability and automatically recognizes downstream beneficiation of mineral products as it distinguishes between refined and unrefined minerals. 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.

From this chapter, it was drawn that it is just and necessary for mineral-rich States, as owners of the minerals, to use mineral fiscal instruments (especially royalties) to charge compensatory fee for the exploitation of their non-renewable scarce resources as well as strategies to promote further mineral processing within their jurisdictions. Also from the country examples, it can also be drawn that, generally, the effects of changes to taxation, and other policies that impact on market conditions hardly affect immediate investments or shut down existing operations but could negatively deter future investments in new projects (Fraser Institute, 2011).

### 6.1.2 Chapter two: The South African Context: Mineral Fiscal Policy Issues

This chapter identified that the investment unattractiveness of a jurisdiction which could be attributed to the fact that many other mineral-rich developing regions or countries offered more favourable investment conditions, led such countries to make over-generous revisions to their mineral fiscal and regulatory policies. The member countries of the SADC were not left out in carrying out such reforms. It was stated that with the State being the sovereign owner of its mineral resources, charging of mineral royalties by the State is justified as long as they do not distort investment decisions.

In accordance to the purpose of the report, the South African mineral and mining policy frameworks and their objectives were reviewed. The history that led to the reform of South Africa's macroeconomic policies, especially those affecting the mining industry – the Minerals and Mining Policy for South Africa (which was released in October 1998), Beneficiation Strategy (which was launched in 2009), MPRDA 2002 – was expounded. The purpose of these policy reforms was to enable the mining industry to address the problems and opportunities confronting it especially in the light of increased competition in commodity markets and for investment attractiveness from other mineral-rich countries. Knowing that the mineral policy of the country outlines the national objectives that the country seeks to achieve from its mining sector, one of the main themes of the Mineral and Mining Policy was 'Business climate and mineral development'. This theme addressed seven topics relevant to the climate for mining business and mineral development including amongst other issues – ownership of mineral rights; mineral fiscal instruments (including royalties); mineral beneficiation.

This chapter focused on the mineral beneficiation intent of these policy frameworks, which showed that the South African government was very keen on promoting the facilitation of not only primary extraction but the establishment of secondary and tertiary mineral-based industries aimed at adding maximum value to raw materials. They opined that companies involved in mineral development could also be involved in downstream minerals beneficiation. Therefore, the government moved that the beneficiation objectives of its policy framework could be achieved using the mining taxation policy to encourage value-addition to raw materials (mineral beneficiation). To facilitate this drive, the mining taxation policy would provide efficient supply-side incentives such as lower royalty rates for projects that include beneficiation. This led to the birth of the Mineral and Petroleum Resources Royalty Act (MPRRA) which provided a reduced royalty rate for refined minerals.

This chapter further broadly stated the history of how South Africa's current royalty regime – Mineral and Petroleum Resources Royalty Act 2008, evolved. The design of the MPRR regime was also expounded basing its structure on the combination of principles of the Gold lease, Mr. I. J. Haarhoff's recommendations to the Frames Commission of Inquiry in 1917 and comparative study against the CIF (1999). The various advantages of the formula-based royalty system were mentioned especially its provisions for facilitating mineral beneficiation, which is in line with standard international practice requirements in which different royalty rates be charged for different minerals based on their difference in value. This allowed for the acknowledgement of the amount of processing required for each mineral product. The chapter ended by acknowledging the integrity and feasibility of MPRRA as a worthy piece of legislature but that the success of its mineral beneficiation policy provisions needed further quantitative analysis and verification.

### 6.1.3 Chapter three: Methodology – Application of Bradley's (Western Australia) model to the South African context

This chapter specified the methodology that was used in this research project. The methodology was derived from the conclusions drawn after carrying out research into the mining royalty system of the country examples given in chapter one, whose mineral fiscal instruments have mineral processing provisions. For the purpose of applying the methodology to the South African context, the Western Australian example was selected because of its dependence on similar strategic commodities like South Africa, coupled with the fact that its royalty regime has provisions for further processing of minerals. This assessment was carried out for application to the South African context, so as to postulate whether the current South African royalty system's beneficiation incentive provisions would yield its desired success of encouraging private sector investment in mineral processing ventures, or not.

In this chapter, WA's royalty system was expounded on and assessed in light of Bradley's work as regards mineral processing provisions. It was identified that the system of collection of royalties in WA was either under the Mining Regulations of 1981 or various State agreement Acts. Its mineral royalty regime had undergone revision at various times. One of the main reviews whose study and recommendations related to the objective of this research report is the Mineral Revenues Inquiry of 1986, headed by Bradley. This review was used and extensively looked into so as to give an understanding and explanation of the WA mineral royalty arrangements, its royalty structure (design) and its mineral processing objectives and requirements, which was in operation at that time. It was highlighted that the mining industry contributed royalties to the WA economy through the realization of net resource value. It was specified also that, in spite of revenue generation from cash royalties, the government of Western Australia still sought to receive additional benefits – further processing of minerals, infrastructural provisions – from mineral development, because of the priority it placed on future regional development and

industrialization. This led them to look at using public (fiscal) policy to induce the industrialization goal. This type of fiscal instrument was referred to as De facto royalties. The incentive provided in the state's De facto royalty system to encourage the establishment of additional processing facilities was the introduction of reduced royalty levies for processed mineral products.

The charge given to the inquiry carried out by Bradley's team was to examine the performance of royalty systems with respect to economic efficiency. The royalty systems were deemed to be economically efficient if they took into consideration the additional expenditure that private developers incurred for their operations and ensured that they did not contribute toward reducing realized resource values from their potential level, or cause distortion of investment decisions or operating plans. As regards further mineral processing requirements, the Bradley inquiry assessed whether the developer that takes up further mineral processing based on the State's grant of a royalty concession in exchange for processing would be better or worse off than in the initial situation – without processing requirements – and by what amount, if any. The structure, principles and methods for applying the Western Australian a*d valorem* royalty system as well as its mineral processing provisions were detailed. The Inquiry gave an analysis of the effect of the mineral processing provisions from the developer's point of view. It showed that in order for a royalty instrument that demands processing commitments, but also offers reduced royalty rate incentives to be efficient, if the sales price received by the developer exceeds specified processing cost, it will be advantageous to proceed with proposed mineral processing plan. Alternatively, if processing costs varied from those prescribed in the schedule listed in the regime, the reduced royalty rate for processed minerals would be a disincentive. Therefore, based on the system's assumptions for the costs needed to take product to next stage of processing which are expressed as a share of final product, Bradley concluded that investment in value-addition could only be justified when the difference in unit price less value-addition cost is greater than the additional costs incurred in refining the production. This meant that since the cost to take

concentrate to refined metal was about 50% of price for refine metal, if the amount of value-added was not significantly greater than this cost, it would not have been a worthy venture to invest in bringing-on a refining facility.

The final section of this chapter, applied Bradley's conclusions on the WA royalty system to the MPRRA, using the model created by Cawood (2011). This model which varied royalty rate with sales price was based on Cawood's interpretation of Bradley's approach after the careful understanding of the similarities and differences between the unique features of the SA and WA royalty regimes was established. The work carried out by Cawood (2011) showed sales price received for refined product (indexed at 100%), as a combination of cost of concentrate plus cost of refinement plus EBIT margin. Proportions of refinement cost, expressed as 10%, 20% and 30% of price of final product were varied against different target EBITs from 0% to 100%, in order to determine the various levels of value that would be added to profitability. Comparing SA regime with Bradley's work on the WA system, it was concluded that the royalty savings gap available to support the value-add appears quite insignificant when compared to that of Bradley's model. Also, substantial value would only be added to a developer's profitability if processing costs are less than or equal to 10% of sales price received, unlike in WA system where this only occurs when costs to take concentrate to refined level is less than or equal to 50% of price received for final product.

### 6.1.4 Chapter four: Impact of MPRRA on the South African mining industry and its contribution to South African economy

This chapter showed that governments have to design their fiscal policy environment in ways that balance their revenue-generation objective with allowing sufficient funds to flow to investors as well so that mining companies' investment decisions are not distorted. Therefore, the MPRR instrument which provides that developers

undertaking further mineral processing will pay a lower royalty rate than developers that extract minerals only, must significantly encourage this investment decision.

Furthermore, this chapter highlighted the effect that the imposition of the MPRRA would have on the South African mining industry and its contribution to the economy. It was indicated that the South African mining sector is a very significant contributor to government earnings. With the imposition of the MPRRA, this would ensure that the sector would play a greater part in contributing to the national economy of South Africa. However, the impact of the new SA mining royalty on all South African mineral producers is that it will add a significant additional cost to the mining sector, thereby, reducing their profit margins. It was also shown that based on the provisions of the Act, refiners would contribute lesser than miners to fiscus. This implies the penalty that miners would pay for not beneficiating their products to specified levels, but in the light of the work carried out by Cawood, this 'penalty' would only be worth avoiding by adding on beneficiation facilities, if their beneficiation costs are less than or equal to 10% of Sales price, or slightly over 10%.

Also, later in this chapter, the PGM industry was specified as sector on which the assessment of this research project was to be carried out. This was based on the fact that in 2010, PGMs were tagged as the biggest revenue generator, but in terms collection of mineral royalties, it was the second biggest contributor, coupled with PGMs being termed as dual-schedule materials according to the specifications in the MPRRA.

A brief overview was given as regards the unique features of this sector and its recovery processes that inform the substantial amount of capital needed required to fund PGM mining projects.

### 6.1.5 Chapter five: Results and Analysis of Platinum case study

This chapter proceeded to apply the methodology of this report to actual data of refining costs and profitability ratios from a platinum company. This analysis was carried out so as to ascertain whether on addition of further mineral processing expenditures, the amount of value added to financial position of miners is sufficient enough to inspire their upgrade to becoming refiners.

Data used for this analysis was taken mainly from the South African platinum mining company – Anglo American Platinum Limited, because of its unique position in the mining industry and because it carries out both quality mining and refining operations. Additional data was also taken from Aquarius, which is one of the companies in joint venture agreement with Anglo American Platinum.

From analysis carried out, it was observed that:

1. The magnitude of royalty rate (which reduced EBITs) varied in tandem with the high or low magnitude of profits received in each year. This is in line with the provisions of the MPRRA, which stipulates that the royalty rate (for either unrefined or refined product) is calculated by varying it with profitability of the mine. For example, for refined production which had good profits in 2006 to 2008, the royalty rates were high, but in year 2009 with depressed profit, the royalty rate was very low;
2. The gap between EBITs before and after the royalty payments (for both unrefined and refined production), as well as the gap between profitability before and after the royalty payments, was greater in the good profit years but decreasingly diminished with movements into years with depressed profits;
3. In comparing the performance of refined and unrefined PGM production**,** from the differences in EBITs and profitability before royalty payments, it can be drawn that on average from all the years analysed that even though the company made significant profits on the sale of refined products, it would have

been more profitable for the company to sell concentrates as opposed to refined products;

4. For 'after royalty' analysis, the EBIT after royalty payments (unrefined) was on the average largely greater than EBIT after royalty payments (refined). This indicated that even with the incentive provisions of the MPRRA, it was more profitable for the company to sell only concentrates;
5. In comparing the behaviour of both production plans, the effect of royalty payment on profitability (refined) and profitability (unrefined), being represented as the difference between profitability before and after royalty payment, however, suggests that unrefined production pays a higher penalty for royalty payment than refinement;
6. Based on the beneficiation incentives provided in the MPRRA, there is a significant amount of royalty savings that would have accrued if refining took place in each year. However, this result was obtained because smelting and refining capex were not factored into the cost calculations. With the addition of S & R capex, it was observed that in most of the years except 2006 & 2007, the royalty payment savings were wiped out;
7. In the scenario analysis carried out to determine what the effect of 'controlled' production cost expenditure would be on royalty savings, it was observed that in good profit years, in terms of value added from royalty savings, the producer that is assessed based on refined royalty payment would have some value accrued to its financial position. The reverse is the case for years with bad profits; and
8. Based on conclusions from Cawood's model (methodology used), with the refinement costs (without S & R capex) spanning from 15% to above 20% but less than 30% of sales price, little value or no valued is added to the miner-turned-refiner. However, on addition of capex to refinement costs, the proportion of refinement costs of sales price increased above the initial values presented, thereby making the value-addition case worse off.

## 6.2 CONCLUSION

The main purpose of this report was to give the answer to the question of whether the policy intent of motivating mineral producers to become refiners would be achieved, based on value-added or not to the financial positions of mining-only and mining plus refining projects.

Nevertheless, in order to support the answer to the question of this report based on experiences from the country examples used in this project, the impact of the beneficiation incentives of their royalty regimes on refining investment could not be determined due to information constraints. In spite of this, another useful lesson that could be drawn is the importance of considering how changes in policies that influence the investment climate impacts on investment flow in general.

The introduction of a royalty could have dramatic or little or no effect on a country's investment climate, depending on the circumstances and the nature of the royalty (Otto et al, 2006). For example, for Ghana which began charging a fixed mineral royalty rate of 5% so as to increase government's take from the mining industry, according to various comments and analysis carried out, it was posited that the new royalty rate was not investor-friendly. The Economist magazine (2010) stated that "the immediate cause of the increase in royalties is a budget deficit of almost 10% of GDP…..mining firms, predictably, are unenthusiastic and say a new royalty regime could deter future investment and in some cases, violate existing agreements…". Also, in Newmont's 64-page socio-economic impact report, it was stated that "…an increase in royalty payments, for example, effectively acts to decrease the life of the mine (and therefore its benefits)…." (Smith-Asante, 2011). Furthermore, according to Fraser Institute 2010/2011 rating of Taxation (royalty inclusive) regime's encouragement of investment, comparing the four countries to one another, NWT's regime, Mongolia, WA and Ghana came 1$^{st}$, 2$^{nd}$, 3$^{rd}$ and 4$^{th}$ respectively. In terms of

Taxation regime not being deterrent to (current) investment, Ghana, NWT, WA, Mongolia came 1st, 2nd, 3rd and 4th respectively. See Table 6.2-1 below:

Table 6.2-1: Taxation regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance) in terms of encouragement of mining investment

| **Country/Rating** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| NWT | 14% | 59% | 22% | 5% | 0% |
| WA | 9% | 44% | 28% | 17% | 2% |
| Ghana | 7% | 63% | 22% | 7% | 0% |
| Mongolia | 11% | 22% | 44% | 17% | 6% |

Source: (Fraser Institute, 2011)

Where,

1: Encourages Investment

2: Not a Deterrent to investment

3: Mild Deterrent

4: Strong Deterrent

5: Would not pursue investment due to this factor

Looking at the percentages, it can be deduced that mineral royalty payments in these countries were not considered as factors that greatly deterred current investment, but they would not significantly encourage future inflow of investment either. From the above, it can be concluded that the imposition of the MPRRA is in line with global trends and it would not necessarily deter investments because it provides for equitable sharing of economic benefits between State and mining companies, in any economic cycle (Netshipale, 2008).

From the econometric analysis, it can be drawn that in both good and bad years, before and after the application of the royalty formula, it was more advantageous to

the miner to produce concentrates and not refined products. Even in the case whereby significant royalty savings were obtained on the application of the royalty formula for refined products as opposed to that of unrefined products, these savings were eradicated on addition of on-going refinement capex. This indicated that the MPRR for refined products was a disincentive because value was destroyed as the miner-turned-refiner's profitability decreased the more. Also looking at the comparison of Cawood's model with the proportion that refining cost make up of sales price which ranged from 15% to about 30%+ (with or without S & R capex factored in), it indicated that little or no value was added to the miner-turned-refiner's profitability.

In conclusion, based on the findings of this project, the answer to the fundamental question posed in chapter one is that the new South African mineral royalty regime is unlikely to encourage miners to become refiners.

## 6.3 RECOMMENDATION

In this report, the equitability and efficiency characteristics of the MPRRA was briefly proven as being sound. However, its beneficiation provisions appeared to be incapable of leading to the realization of the mineral beneficiation objective of the SA government. It was also the opinion of Rocha (2011), that the new royalty Act's beneficiation incentive on a general note would not necessarily encourage miners to become refiners because the Act came in to force after most companies had established their refining subsidiaries, for example, Impala Platinum Limited and Amplats.

However, it is recommended that this initiative should not be discarded off but further studies:

1. can apply the econometric analysis undertaken in this project to other commodity sectors like manganese, iron ore, so as to ascertain if the conclusion

of this project is platinum industry-specific or it applies to the entire mining industry;

2. can apply the MPRRA's beneficiation provisions to refining subsidiaries, so as to ascertain if this policy incentive would encourage the refining subsidiaries to move-up to other different stages of beneficiation;
3. can simulate the MPRRA's beneficiation provisions to the circumstances of other mineral-rich developing countries that do not refine their minerals at present and carry out the type of econometric analysis done in this project to ascertain whether their miners would be encouraged to become refiners;
4. can assess different ways to ensure that the MPRRA regime would better facilitate the miner-turned-refiner to realise sufficiently more profits than the miner-only, on addition of refining facilities and processes. This is proposed especially in light of the fact that extractive companies which also have refining subsidiaries have not and are currently still not boasting of the realisation of significant profits. This is due to the highly capital-intensive nature of refining processes coupled with the low prices being received for their products (for example, PGMs). With these issues, many producers have sought and are still seeking ways to control their production costs but the achievement of such conservativeness seems to be hindered by many factors which are unique to their individual operations. More so, producers becoming conservative on capital expenditure may also equate to reduced development and expansion of their operations. Therefore, in order for the SA government to achieve its beneficiation policy objectives, its fiscal instruments should take into consideration the above-mentioned unfavourable conditions which the refined minerals market is susceptible to, couple with the knowledge that producers are price-takers which hardly have any control over the prices received.

   In pursuit of this, it can incentivise mining companies on their cost-side by looking into 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. 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. It is suggested that this could be achieved either by reducing the maximum rate; or manipulating the F-factor of 12.5 (which determines the maximum rate for refined rate); or manipulating the royalty base to allow for deduction of some costs (marketing, transport, other operating and/or capital) attributed to refining.

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## Appendix 1A

| ANGLO AMERICAN PLATINUM (Group analysis- Refined PGM) Base case | | | | | | |
|---|---|---|---|---|---|---|
| | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
| Gross revenue | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| Mining costs | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| Purchased metals | R | 3 947 000 000 | 5 539 000 000 | 8 999 000 000 | 6 689 000 000 | 9 215 000 000 |
| Smelting costs | R | 1 238 000 000 | 1 314 000 000 | 1 625 000 000 | 1 881 000 000 | 1 846 000 000 |
| Treatment and Refining costs | R | 915 000 000 | 1 047 000 000 | 1 151 000 000 | 1 460 000 000 | 1 467 000 000 |
| EBIT before Royalty | R | 20 273 000 000 | 22 936 000 000 | 19 100 000 000 | 7 374 000 000 | 13 905 000 000 |
| EBIT/Revenue before Royalty | % | 51.51% | 48.84% | 37.36% | 19.96% | 30.00% |
| Refined Royalty Rate | % | 4.62 | 4.41 | 3.49 | 2.10 | 2.90 |
| Royalty paid | R | 1 818 620 000 | 2 069 685 000 | 1 783 590 000 | 774 655 000 | 1 344 160 000 |
| EBIT after Royalty | R | 18 454 380 000 | 20 866 315 000 | 17 316 410 000 | 6 599 345 000 | 12 560 840 000 |
| EBIT/Revenue after Royalty | % | 46.89% | 44.43% | 33.88% | 17.86% | 27.10% |

## Appendix 1B

| (R) | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT before Royalty (Refined) | R | 20 273 000 000 | 22 936 000 000 | 19 100 000 000 | 7 374 000 000 | 13 905 000 000 |
| EBIT/Revenue before Royalty (Refined) | % | 51.51% | 48.84% | 37.36% | 19.96% | 30.00% |
| Refined Royalty Rate | % | 4.62 | 4.41 | 3.49 | 2.10 | 2.90 |
| Royalty paid (Refined) | R | 1 818 620 000 | 2 069 685 000 | 1 783 590 000 | 774 655 000 | 1 344 160 000 |
| EBIT after Royalty (Refined) | R | 18 454 380 000 | 20 866 315 000 | 17 316 410 000 | 6 599 345 000 | 12 560 840 000 |
| EBIT/Revenue after Royalty (Refined) | % | 46.89% | 44.43% | 33.88% | 17.86% | 27.10% |

## Appendix 2A

| ANGLO AMERICAN PLATINUM (Group analysis- Unrefined PGM) Base case | | | | | | |
|---|---|---|---|---|---|---|
| | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
| Tonnes milled | t | 43 792 000 | 41 563 000 | 42 611 000 | 43 114 000 | 42 242 000 |
| Head grade | g/t | 3.81 | 3.63 | 3.36 | 3.31 | 3.23 |
| recovery | | 98% | 98% | 98% | 98% | 98% |
| Recovered metal | g | 163 510 570 | 147 856 216 | 140 309 501 | 139 853 193 | 133 712 827 |
| Metal in concentrate (Recovered metal) | oz | 5 257 000 | 4 753 699 | 4 511 066 | 4 496 396 | 4 298 978 |
| Prices received (sheet3) | R/oz | 7 114 | 9 200 | 12 863 | 6 211 | 8 689 |
| Gross revenue | R | 37 398 297 039 | 43 734 035 155 | 58 025 846 332 | 27 927 113 530 | 37 353 818 298 |
| Mining costs | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| EBIT before Royalty | R | 24 415 297 039 | 27 609 035 155 | 37 782 846 332 | 8 384 113 530 | 17 434 818 298 |
| EBIT/Revenue before Royalty | % | 65.28% | 63.13% | 65.11% | 30.02% | 46.67% |
| Unrefined Royalty Rate | % | 7.00 | 7.00 | 7.00 | 3.84 | 5.69 |
| Royalty paid | R | 2 617 880 793 | 3 061 382 461 | 4 061 809 243 | 1 071 203 738 | 2 123 971 125 |
| EBIT after Royalty | R | 21 797 416 247 | 24 547 652 694 | 33 721 037 088 | 7 312 909 792 | 15 310 847 174 |
| EBIT/Revenue after Royalty | % | 58.28% | 56.13% | 58.11% | 26.19% | 40.99% |

**Appendix 2B**

Using Aquarius Concentrate prices based on averages from Kroondal and Marikana mines

Kroondal

| | | 2010 | 2009 | 2008 | 2007 | 2006 |
|---|---|---|---|---|---|---|
| Attributable PGM production - in concentrate | oz | 204 285 | 211 039 | 195 558 | 219 674 | 219 722 |
| Revenue - attributable | $ | 230 000 000 | 146 000 000 | 347 000 000 | 279 500 000 | 214 300 000 |
| Price received | $/oz | 1 126 | 692 | 1 774 | 1 272 | 1 290 |
| R/$ exchange rate | R/$ | 7.58 | 9.03 | 7.23 | 7.18 | 6.37 |
| Price received | R/oz | 8 534 | 6 247 | 12 829 | 9 135 | 8 219 |
| cost per PGM produced | R/oz | 5 769 | 5 174 | 4 241 | 3 069 | 2 565 |

Marikana

| | | 2010 | 2009 | 2008 | 2007 | 2006 |
|---|---|---|---|---|---|---|
| Attributable PGM production - in concentrate | oz | 67 709 | 78 969 | 62 791 | 66 187 | 56 617 |
| Revenue - attributable | $ | 79 000 000 | 54 000 000 | 112 000 000 | 85 400 000 | 53 400 000 |
| Price received | $/oz | 1 167 | 684 | 1 784 | 1 290 | 943 |
| R/$ exchange rate | R/$ | 8 | 9 | 7 | 7 | 6 |
| Price received | R/oz | 8 844 | 6 175 | 12 896 | 9 264 | 6 008 |
| cost per PGM produced | R/oz | 7 133 | 6 677 | 7 575 | 5 219 | 4 980 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Average price of 2mines | R/oz | 8689 | 6211 | 12863 | 9200 | 7114 |

## Appendix 2C

| (U) | Units | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT before Royalty (Unrefined) | R | 24 415 297 039 | 27 609 035 155 | 37 782 846 332 | 8 384 113 530 | 17 434 818 298 |
| EBIT/Revenue before Royalty (Unrefined) | % | 65.28% | 63.13% | 65.11% | 30.02% | 46.67% |
| Unrefined Royalty Rate | % | 7.00 | 7.00 | 7.00 | 3.84 | 5.69 |
| Royalty paid (Unrefined) | R | 2 617 880 793 | 3 061 382 461 | 4 061 809 243 | 1 071 203 738 | 2 123 971 125 |
| EBIT after Royalty (Unrefined) | R | 21 797 416 247 | 24 547 652 694 | 33 721 037 088 | 7 312 909 792 | 15 310 847 174 |
| EBIT/Revenue after Royalty (Unrefined) | % | 58.28% | 56.13% | 58.11% | 26.19% | 40.99% |

## Appendix 3

| | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| EBIT before Royalty: (U) - (R) | R | 4 142 297 039 | 4 673 035 155 | 18 682 846 332 | 1 010 113 530 | 3 529 818 298 |
| Profitability before Royalty: (U) - (R) | % | 13.77% | 14.29% | 27.75% | 10.06% | 16.68% |
| Royalty payment savings: (U) - (R) | R | 799 260 793 | 991 697 461 | 2 278 219 243 | 296 548 738 | 779 811 125 |
| EBIT after Royalty: (U) - (R) | R | 3 343 036 247 | 3 681 337 694 | 16 404 627 088 | 713 564 792 | 2 750 007 174 |
| Profitability after Royalty: (U) - (R) | % | 11.39% | 11.70% | 24.24% | 8.32% | 13.89% |

**Appendix 4A**

| Cost ratio | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Cm | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| Cr | R | 6 100 000 000 | 7 900 000 000 | 11 775 000 000 | 10 030 000 000 | 12 528 000 000 |
| Total cost (Ct) | R | 19 083 000 000 | 24 025 000 000 | 32 018 000 000 | 29 573 000 000 | 32 447 000 000 |
| Percentage of Cm of Ct | % | 68% | 67% | 63% | 66% | 61% |
| Percentage of Cr of Ct | % | 33% | 33% | 37% | 34% | 39% |
| Proportion of costs of Sales Price | | | | | | |
| Gross Revenue as a proxy of Sales Price | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| Percentage of Cm of Gross Revenue (Sales price) | % | 33% | 34% | 40% | 53% | 43% |
| percentage of Cr of Gross Revenue (Sales price) | % | 15% | 17% | 23% | 27% | 27% |

**Appendix 4B**

| Cost ratio | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Cm | R | 12 983 000 000 | 16 125 000 000 | 20 243 000 000 | 19 543 000 000 | 19 919 000 000 |
| Cr | R | 6 100 000 000 | 7 900 000 000 | 11 775 000 000 | 10 030 000 000 | 12 528 000 000 |
| Total cost (Ct) | R | 19 083 000 000 | 24 025 000 000 | 32 018 000 000 | 29 573 000 000 | 32 447 000 000 |
| Proportion of costs of Sales Price | | | | | | |
| Gross Revenue as a proxy Sales Price | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| percentage of Cr of Gross Revenue (Sales price) | % | 15% | 17% | 23% | 27% | 27% |

## Appendix 4C

| Cost ratio | | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Purchased metals | R | 3 947 000 000 | 5 539 000 000 | 8 999 000 000 | 6 689 000 000 | 9 215 000 000 |
| Smelting costs | R | 1 238 000 000 | 1 314 000 000 | 1 625 000 000 | 1 881 000 000 | 1 846 000 000 |
| Treatment and Refining costs | R | 915 000 000 | 1 047 000 000 | 1 151 000 000 | 1 460 000 000 | 1 467 000 000 |
| S & R Capex | R | 489 000 000 | 860 000 000 | 2 504 000 000 | 2 194 000 000 | 1 502 000 000 |
| Cr | R | 6 589 000 000 | 8 760 000 000 | 14 279 000 000 | 12 224 000 000 | 14 030 000 000 |
| Proportion of costs of Sales Price | | | | | | |
| Gross Revenue as a proxy Sales Price | R | 39 356 000 000 | 46 961 000 000 | 51 118 000 000 | 36 947 000 000 | 46 352 000 000 |
| Percentage of Cr of Gross Revenue (Sales price) | % | 17% | 19% | 28% | 33% | 30% |