

---

## **Platinum Group of Metals: a strategic assessment of the South African industry**

---

**A.K. Garg\***

Civil Engineering Department,  
University of Botswana,  
Private Bag 0061,  
Gaborone, Botswana  
E-mail: akg20055@yahoo.co.in

and

Department of Mines,  
Private Bag 0049,  
Gaborone, Botswana  
E-mail: agarg@gov.bw

\*Corresponding author

**R. Van Tonder**

Graduate School of Business Leadership,  
University of South Africa,  
Midrand, South Africa  
E-mail: sbl@unisa.ac.za

**Prof. (late) R.J.O. Joubert**

Formerly of Economics, Strategy, Financial Markets,  
Graduate School of Business Leadership,  
University of South Africa,  
Midrand, South Africa

**Abstract:** In order to analyse the strategic issues with regard to the South African Platinum Group of Metals (PGM) industry, a risk analysis and an assessment of the competitiveness of the industry were conducted. The analysis of risk related to market conditions indicates a relatively low risk rating driven by increased demand for jewellery and autocatalysts, while the industry is exposed to moderate risk for raw materials and supporting services, which is expected to remain moderate in future. Overall, the current risk for production factors was found to be moderate and is expected to remain moderate over the medium term. The results of industry risk analysis indicate that the PGM industry is currently exposed to moderate risk. Applying Porter's diamond model (Porter, 1990), the research found that the South Africa's PGM industry has a very strong platform and is expected to become more competitive in future, although increased cooperation will still be evident. The competitiveness of South African producers is expected to increase over the medium term, since most of the expansion will come on stream in the near future. The paper also discusses the development potential of South Africa in line with the exploitation of PGM.

**Keywords:** competitiveness; country risk; Platinum Group of Metals; South Africa; strategy.

**Reference** to this paper should be made as follows: Garg, A.K., Van Tonder, R. and Joubert, R.J.O. (2007) 'Platinum Group of Metals: a strategic assessment of the South African industry', *Int. J. of Indian Culture and Business Management*, Vol. 1, Nos. 1/2, pp.174–204.

**Biographical notes:** Dr. A.K. Garg teaches Mining and Management subjects at the University of Botswana. He is associated with School of Business Leadership, University of South Africa; De Montfort University Southern Africa in supervising research to students in Masters Programme. He is a keen researcher in the areas of strategic management, information systems, business IT alignment and teaching methodology. He has published in various journals, and contributed to seminars in South Africa, Botswana, USA and India. After graduating in 1987 from Indian School of Mines, Dhanbad, India he continued his higher education along with industry experience. He completed Masters in Engineering in 1991, Masters in Business Administration in 1994 and was awarded Doctorate in Business Leadership during 2003 in South Africa. He is a holder of first class certificate of competency to manage a mine in India, an Associate member of Institution of Engineers, India and is competent in Rough Diamond Evaluation, certified by Mining Qualification Authority of South Africa. He has extensive industry experience at various management positions and worked for Government of Botswana for the last nine years before joining the university. He was the key member in implementation of the Kimberley Process Certificate Scheme in Botswana.

Mrs. Renita van Tonder currently heads the Wood, Paper and Other SBU at Industrial Development Corporation in South Africa. She also worked as a Project Manager in Mining SBU during 2000–2003. She is a Graduate in Mathematical Statistics and Masters in Business Leadership from the University of South Africa. She researches in management and refocusing of SBU's to be more efficient and effective. She was awarded Employee of the Year award and SBU Head of the Year award in 2004 by IDC. She worked for University of Pretoria as a Junior Lecturer for first year undergraduate Statistics students in 1994 and for second year students in 1995. Her hobbies include tennis, diving, hiking, golf and squash.

Prof. Reinhold Joubert taught Management Economics Strategy and International Financial Markets on the MBL degree programmes. His most recent focus areas was on strategic alliances for companies in Africa, healthcare and function of stock exchanges in mobilising capital in emerging economics and capital efficiency. He consulted for the Department of Trade and Industry as well as many companies in the private sector, and was a member of SACOB's Economic Policy Committee, which included the activities of the Labour Policy Committee and Industrial Policy. Most of his business career was in Merchant Banking, covering primarily the areas of Financial Markets, Real Estate and Product Innovation to the level of Executive chairman. He has published widely in scientific journals and text books/readings. He was awarded Academic merit bursaries for Honours and Masters Studies from the University of Stellenbosch and received the Oppenheimer Trust bursary for Doctoral Research at London School of Economics. He received the South Economic Society Award and Prize for his Doctoral Thesis.

---

## 1 Introduction

The discovery of world-class diamond and gold deposits in South Africa in the latter half of the 19th century laid the foundations for the transformation from an essentially agricultural to a modern industrial economy. Mining – embracing numerous other minerals too, of which South Africa has an exceptional geological endowment – remained at the heart of the economy during the 20th century. The mining industry is positioned to be a significant contributor to the government's objectives of employment creation, rural upliftment and regional development and, more broadly, to ensuring future economic development. Mining sectors other than gold are currently showing significant growth, but were historically overshadowed by the declining gold sector. Measured in terms of production, the coal, Platinum Group of Metals (PGM) and chrome sectors have doubled in size since 1980. These industries are larger than most manufacturing subsectors.

The South African PGM industry is the largest mining activity in South Africa in terms of sales value, with total sales amounting to US\$5.16 billion in 2004 (or 26.6% of total primary<sup>1</sup> mineral sales), the majority destined for export markets (about 90%) (DME, 2005). During the last two decades, total PGM sales increased exponentially at a rate of 6.3% per annum, while production maintained strong positive growth at 4.4% per annum from 1985 to 2004, despite a 4.5% reduction in 1999 (DME, 2005).

In terms of job creation, the PGM industry is the second largest after the gold industry. During 2004, it created employment opportunities for approximately, 151,000 employees (33% of the total mining industry employment as compared to 40% for gold industry) and was responsible for some 27% (or about Rs. 9 billion) of the total mining industry remuneration compared to some 37% for gold industry (SAMI, 2004–2005). Four integrated mining groups operate, each with a refinery.

South Africa leads the world in PGM reserves (71%), followed by Russia (13%), Zimbabwe (11%) and the rest shared mainly by the USA and Canada (Wilburn and Bleiwas, 2004). South Africa supplies more than 50% of the total world PGM supply, and supplied 54% of the world PGM supply during 2004 (250.5 tonnes) and 2005 (259.2 tonnes) (Johnson, 2005).

Wilburn and Bleiwas (2004) project the total platinum supply from primary and secondary sources at 333 tonnes by 2010, which represent an increase of about 91 tonnes (69 tonnes from primary sources and 22 tonnes from secondary sources), or 38% higher than 2003 estimates. The largest projected increase from primary sources would be from South Africa (39 tonnes), followed by Russia (9.6 tonnes), Zimbabwe (8.8 tonnes), USA (7.3 tonnes) and the rest from other smaller sources. The supply of palladium from primary and secondary sources is estimated at 400 tonnes by 2010, which represents an increase of 196 tonnes (89 tonnes from primary sources and 107 tonnes from secondary sources), or 68% higher than 2003 estimates. The largest projected increase from primary sources that would be from Russia (29 tonnes), followed by South Africa (24 tonnes), with the development of the UG2<sup>2</sup> reef, which contains higher palladium and rhodium content. Palladium recovered from autocatalysts could account for about 23% of total palladium supply in 2010, and recycled electronics could account for an additional 8%. World production capacity of other PGMs could increase by as much as 10.5 tonnes from primary capacity and about 7.1 tonnes from recycling, or an increase of 25% between 2003 and 2010. A marginal oversupply by 2010 for all PGMs is projected by Johnson (2005) and Wilburn and Bleiwas (2004). However, this does not include demand with

respect to fuel cell technology, which is not likely to be commercialised by 2010. Increase in demand will positively impact South African producers, who hold more than half the identified resources.

The price of PGMs has reacted to numerous global economic, political and technological events. The price of palladium increased significantly (by approximately 77%) between 1999 and 2000, reaching an annual average high of US\$924/oz in 2000, dropped to below US\$200/oz during 2003 and were capped at just above US\$200/oz throughout the first nine months of 2005. The platinum price also increased to an annual average of US\$550/oz in 2000, increasing by almost 40% during 2000. However, prices weakened during the last quarter of 2001. In 2003, platinum crossed the mark of US\$800/oz, partly in reaction to a US government proposal to provide US\$1.7 billion in federal funding to develop hydrogen-powered vehicles that would use platinum in fuel cells. Platinum prices have been higher since then, and the demand from China and India has contributed to the price hike. During 2006, the platinum price crossed the level of US\$1200/oz, with some signs of further improvements (platinum.matthey.com; Platinum and Palladium Review for 2000–2006).

South African producers are reacting positively to the significant increase in demand, which is projected to persist for some time, as Russian stockpiles are believed to be depleted (Platinumfor.net, 2005). Factors that affect South African production have a significant impact on world supply. The country's mining policies and other events are critical to the PGM industry, both locally and worldwide. The appreciation of the Rand against the US Dollar since late 2001 is reportedly affecting the rate of various South African expansion projects (Mining Journal, 2003). The appreciation of the Rand is increasing mining costs, as many South African operations base their internal operating costs on the Rand, while sales are based on the US Dollar. Differences resulting from short-term exchange rate variations may be as short as one year and should not have a major affect on worldwide supply–demand scenarios, but longer rate variations may affect future development plans or economic profitability (Wilburn and Bleiwas, 2004).

In order to analyse the strategic issues with regard to the local PGM industry, a risk analysis and an assessment of the competitiveness of the industry was conducted.

## **2 Literature review**

### *2.1 Risk analysis*

Much research has been done on the financial risk of companies in order to analyse future returns on a portfolio of investments in a specific industry. However, the risk analysis of an industry should not focus only on the financial risks, but also on the strategic risks related to the industry. This will enable the producer to develop appropriate strategies to address the various risk factors or to decrease the level of risk from a strategic perspective (Grant, 1998).

The assessment of industry risk should take into account the various factors that influence the strategies and the environment of the industry. These factors may vary from industry to industry, but given the type of industries operating in South Africa and the current environment impacting on them, the following prominent factors could be identified and should be addressed by risk analysis.

### *2.1.1 Markets*

All industries operate in either the domestic or international market. Mohr and Fourie (2000) states that:

“A market is any contact or communication between potential buyers and potential sellers of a good or service.”

Every industry is influenced by fluctuations in the market either through movements in demand, supply, price or global macro conditions.

Therefore, in order to analyse the risks related to product markets, various variables need to be analysed. Price is a key driver of demand and supply in an open market. Recent price movements or price behaviour should thus be assessed in line with their influence on global market share and competition (Mohr and Fourie, 2004). Other important risk factors when assessing the risks related to product markets are the level of product differentiation and the various barriers to entering the market or to importing products. These factors will also link to the competitiveness of the industry (Grant, 1998). Most of the South Africa’s mining producers export their products – almost 90% of total sales of the local PGM industry are exported.

The analysis of risks related to market conditions will thus focus mainly on the market risks in the international arena.

Exhaust emissions standards that are being implemented in the US will lead to an increased demand for rhodium. The increased demand is also expected from Japan and Europe. Furthermore, the increased use of autocatalysts in diesel engines and stricter durability requirements will result in greater platinum use, while development of the lean-burn engine is expected to promote the use of the tri-metal autocatalyst. Fuel cells are also expected to become a market driver after 2010.

Prices declined during 2001, but are at their highest levels during 2006. Barriers to entry are relatively high where access to high quality reserves remains important. Future risk is expected to diminish since Russia’s stockpiles are diminished, South African producers are expanding to increase volume output; platinum jewellery demand is increasing; and environmental concerns will stimulate the demand for autocatalysts.

### *2.1.2 Production factors*

Another important area of industry risk is related to production factors. These factors include labour conditions and labour markets, capital and technology and raw materials and services (Mohr and Fourie, 2004). Mohr and Fourie (2000) defines labour as:

“the exercise of human mental and physical effort in the production of goods and services”.

The risks related to labour markets focus on wages, productivity, skills, union activity, the availability of trained workers as well as training initiatives in order to ensure the development of the appropriate skills (Swanepoel et al., 1998). Capital comprises of all manufactured resources that are used in the production of other goods and services. Technology and technological developments are also an important aspect, which affecting capital. The risks related to capital and technology should be analysed in relation to the nature and age of the equipment used, the sources of capital and the level of research and development of the industry, and the availability of finance to ensure continuous improvement (Mohr and Fourie, 2004).

Input costs always play an important role in the cost structure and profitability of an industry. Therefore, it is also important to analyse risks related to raw materials as well as the level of service. The availability of these products as well as the reliability of the suppliers is important in developing appropriate strategies to ensure future growth (Porter, 1990).

### *2.1.3 Policy*

Apart from market risks and risks related to production factors, various policies also impact on industries. These policies include trade policy, industrial policy, monetary and fiscal policy as well as environmental policies. Historically, South Africa's trade and industrial policies focused on import replacement and self-sufficiency. During the mid 1980s, however, it became apparent that a continued inward orientation offered limited growth potential (Holden, 1994). South Africa was thus forced to go through political transformation to allow the reintegration of the country into the world economy.

Many industrial policies, previously considered to be domestic, have now become trade-related and therefore integrally linked to the international trading environment and rules (IDC, 1997). Monetary policies that impact on industries are determined mainly by the South African Reserve Bank. Mohr and Fourie (2000) defines monetary policy as

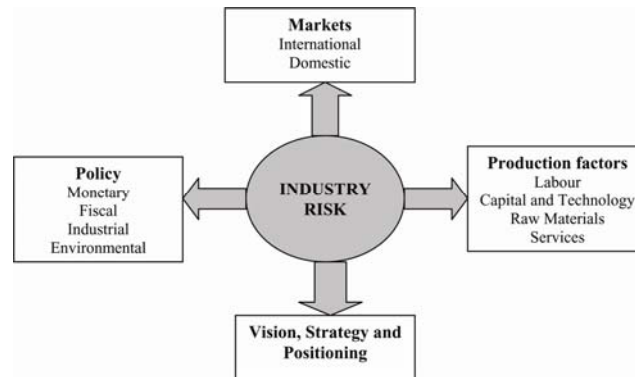
“the measures taken by the monetary authorities to influence the quantity of money or the rate of interest with a view to achieving stable prices, full employment and economic growth”.

Interest rates have a considerable influence on industries. Mismanagement of a country's monetary and fiscal environment could lead to economic risk, which would cause changes in a country's business environment (Hill, 2000). Environmental policies are becoming increasingly stricter, especially in the mining industry where appropriate environmental assessments need to be conducted. Each mine has to submit an Environmental Impact Assessment before production starts. Stricter emission policies and rehabilitation standards are also increasing the risks for operators, as costs are involved. Minerals Bill forms the part of government's objective to effectively regulate the mining industry in South Africa through the introduction of new policies and legislation. Industrial policy is regulated and implemented by government through the Department of Trade and Industry; however, South Africa needs more effective policies to promote industrial development. All the risks related to policies are analysed with respect to their interaction or effect on sales.

### *2.1.4 Vision, strategy and position*

The final factor in the risk analysis focuses on risks related to the industry's vision, current strategy and positioning within the competitive environment. Important factors to be analysed in this context include overall industry cooperation, supplier/buyer relationships, cluster cooperation and overall work organisation (Porter, 1990). A sound relationship with clients and suppliers will ultimately create a better environment, which will enhance competitiveness.

The overall risk exposure of the industry is analysed according to the variables discussed (Figure 1).

**Figure 1** Risk factors

Source: IDC (1999).

The various factors and variables incorporated in the risk analysis were identified through research done by the Industrial Development Corporation (IDC). The assessment is based on the matrix techniques first used by the Boston Consulting Group (Henderson, 1989). The underlying principle is that it is not only the variable under examination, but also its interaction with other variables that determines its effectiveness/total score. Risks are not determined by examining various variables in isolation, but by the strength or lack of the relationship between variables and competitive factors.

## 2.2 Porter's framework for the analysis of the competitive advantage of nations

According to Porter (1990),

“the basic unit of analysis for understanding competition is the industry. An industry (whether product or service) is a group of competitors producing products or services that compete directly with each other”.

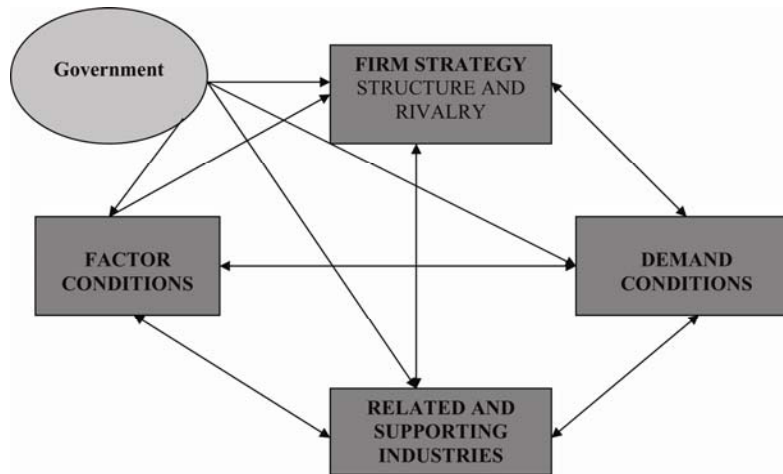
Firms operating in an industry strive to obtain a sustainable competitive advantage in the international playing field, and this is achieved mainly through improvement, innovation and upgrading. However, the competitive environment in which they operate is an important determinant of their competitive advantage and strategies. It is a common knowledge that certain countries or nations achieve international success in certain industries. Porter believes that this is due to four broad attributes of a nation that influence the environment in which local firms compete, and that either stimulate or impede the creation of competitive advantage (Porter, 1990). These attributes are summarised as follows:

- a *Factor conditions*: the position of a nation in terms of factors of production such as skilled labour or infrastructure necessary to compete in a given industry.
- b *Demand conditions*: the nature of home demand for the industry's product or service.
- c *Related and supporting industries*: the presence or absence in the nation of supplier industries and related industries that is internationally competitive.
- d *Firm strategy, structure and rivalry*: the conditions in the nation governing how companies are created, organised and managed and the nature of domestic rivalry.

Another important attribute of a nation that influences the competitive advantage of the firms within an industry is the government, which can improve or detract from the national advantage. To the four attributes of Porter, we could thus add the government through the level of intervention or the absence of intervention at all levels.

The determinants as described, jointly with the level of government's intervention, create the environment in which the firms operate, both individually and as part of a system. A sustainable competitive advantage is developed only if a dynamic and challenging environment is created that stimulates innovation, improvement and continuous development. Porter refers to the four attributes and their inter-linkages as the 'national diamond' (Porter, 1990) (Figure 2). The 'diamond' is a mutually reinforcing system. Thus, the state of each of the various determinants is contingent on the state of the others. It is also important to note that the basic unit of analysis is the industry. Competitive advantage based on only one or two determinants, which is possible in natural resource-dependent industries (such as mining) or industries involving little sophisticated technology or skills. Porter warns that such advantages usually prove unsustainable, however, because they shift rapidly, and global competitors can easily circumvent them (Porter, 1990). Advantages throughout the diamond are therefore necessary for achieving sustainable competitiveness. Overall, nations do not succeed in isolated industries, but in clusters of industries with various relationships.

**Figure 2** Porter's diamond



Source: Porter (1990).

By applying the framework of Porter's diamond model to the PGM industry, the overall strength of the competitive platform of the industry can be determined.

### 2.3 Competitiveness

A nation's competitiveness can be defined according to Unger (1996) as:

"the ability of business or government to mobilise investment, labour, technology, information and other resources to gain markets at home and abroad on the basis of cost, quality, uniqueness or other differentiating factors".



However, competitiveness in its most simple form can be seen as an ability to compete, which is a motivating factor and is imperative for success. The basic components can be regarded as efficiency and productivity, but lately competitiveness is more closely related to quality (of product or service). Value is the combination of efficiency and quality (Unger, 1996). Global competitiveness and the value added by it have become an important survival strategy for modern business (Du Plessis, 2001).

In order to analyse any industry, one needs to assess its competitiveness, which is not easy to quantify. The composite competitiveness index can be calculated to reflect the industry's performance with respect to price, quality and delivery. The final composite index is derived from three time series, each calculated as an indicator of competitiveness over time, one of which quantifies the cost competitiveness of the industry.

The composite index is designed to approximate movements in competitiveness. It is also designed to have turning points that coincide with those of the overall business cycle (Green and Beckman, 1992).

South Africa, as a mineral-rich country, has always been prominent in the international mining arena. However, the competitive environment in which mining houses operate has been fundamentally transformed during the last two decades, which has led to major challenges for business in South Africa. Today, productivity, quality, customer service and speed have become competitive imperatives. Role players have to excel at all of these not only to compete but also to survive. It is thus important not only to develop but also to sustain a business strategy (Ferreira, 2000).

South African exports increased as a percentage of world exports until 2000. Increased world demand has forced South African producers, who were already running at almost maximum capacity, to commit themselves to major capital expenditure programmes over the next few years. This will not only increase South Africa's market penetration but will also stimulate future competitiveness through technology improvements and the utilisation of more efficient production techniques.

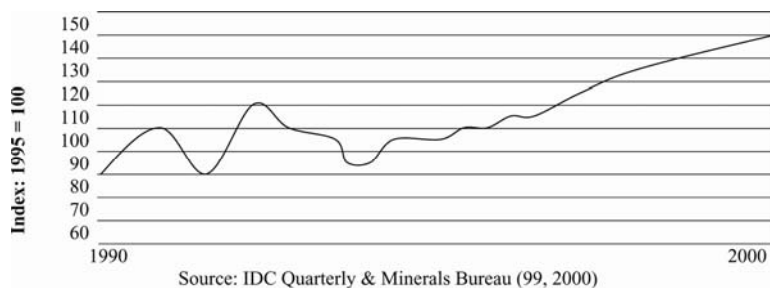
South Africa's overall competitiveness has improved since 1991 as a result of increased market penetration and an improvement in the cost competitiveness of industry. Decreasing operating costs, more efficient operations and increased labour productivity (measured by output per employee) were the main factors contributing to the increased cost competitiveness.

Furthermore, increased partnering between suppliers and consumers has started to develop. This move will not only increase flexibility to suit the end-user, but will also stimulate effectiveness through cost-sensitive operations. Increased competitiveness was further stimulated by an increase in demand supported by South Africa's rich reserve base and development potential.

However, increased transport costs during 2000 and higher raw material costs negatively affected cost competitiveness. This shift was reversed by increased foreign earnings from higher platinum prices.

The overall competitiveness index is a composite index reflecting the industry's performance with respect to production cost, international market penetration and world price vs. production cost deviations (Figure 3).

**Figure 3** Composite competitiveness index: PGMs



Source: IDC Quarterly and Minerals Bureau (1999, 2000).

#### 2.4 Development potential

South Africa is a country with:

- abundant natural resources
- a large domestic market with a population of 40 million
- an extremely well-developed infrastructure of harbours, roads, rail, telecommunication and power
- a sophisticated banking system and capital market with the 12th largest stock exchange in the world
- a strong, long-established and well-diversified private business sector with a strong entrepreneurial spirit.

However, as a result of politics, economic policy and high population growth in the past, South Africa is also faced with:

- large-scale unemployment
- a massive gulf between the social infrastructure of the black and white communities in the areas of healthcare, housing, education and social amenities
- a large poorly educated and trained proportion of the population
- an industrial sector that is not internationally competitive in many areas, particularly those that are labour-intensive
- historically low foreign reserves at the start of the upturn in the economic cycle with limited prospects for large-scale foreign investment until the country has proved itself under the new political dispensation.

It is evident that in order for South Africa to develop to its full potential, it needs to build on its strengths and address its development needs (IDC, 1998).

The Southern African region has experienced unprecedented political and socio-economic changes over the past few years. Much progress has been made in creating an environment characterised by economic reforms, political stability and increasing regional cooperation and integration. The challenge for development in the Southern

African region is that the region is historically characterised by inequalities, national economies dependent on commodity exports and weak institutional capacity. The region is also confronted by the challenges presented by globalisation and an ever-increasing competitive global business environment.

The assessment of the development potential of an industry is essential for developing appropriate strategies to ensure future competitiveness and sustainability over the longer term. The principal goal of development is to attain a better life for all, firstly by meeting basic needs and then by presenting opportunities to attain self-fulfilment and prosperity (IDC, 2000). Government's National Policy Objectives (NPO) are as follows:

- promoting and sustaining a high rate of investment in the mining industry
- encouraging investment in appropriate technology
- promoting and sustaining job creation
- eradicating poverty and facilitating social upliftment
- Black Economic Empowerment (BEE)
- promoting and sustaining an export orientation of beneficiated products
- promoting spatial development initiatives.

The development of an industry in line with these objectives should thus benefit not only the industry but also the entire country over the long-term.

The PGM industry has recently moved into a phase in which most producers are focusing on BEE. Among the BEE deals, recently, announced are the purchase of a 22.5% share in Northern Platinum by Mvelaphanda Platinum and the joint venture agreement between Angloplats and African Rainbow Minerals, spoken of before, but announced late in August 2001, through which a mining consortium will undertake mining at Maandagshoek in the eastern part of the Bushveld Complex. The deal also includes representatives from communities affected by mining operations. As such, it signifies real empowerment of a broader sector of the community, especially around the area where mining will take place.

The industry has a high development potential, which it is important to pursue in order to ensure the upliftment of the South African workforce.

### **3 Research hypothesis and testing methodology**

The framework, which was used to analyse the competitiveness of the industry, is the model of international competitiveness devised by Porter (1990). This framework implies the utilisation of the 'five forces model' on the industry to determine the relative strength of the industry platform of competitiveness and overall competitive advantage. The criteria for understanding the basis of competitive advantage include factor advantage (basic costs as well as specific advantages created through innovative endeavour), domestic demand conditions, domestic rivalry, and a number of structural and cultural considerations which involve supporting and related industries. The overall development potential of the industry was analysed with regard to South Africa's NPO and the industry's relative fit.

Based on the literature review, the following hypotheses were proposed, and the methodology to test each of them is reported below each hypothesis.

*Hypothesis 1:* The PGM industry in South Africa is exposed to moderate risk in terms of markets, production factors, policies and vision (a risk percentage between 80 and 100% was interpreted as very high risk, between 60 and 80% as high risk, between 40 and 60% as moderate risk and below 40% as low risk).

Testing methodology: A matrix technique was used by calculating for each matrix (comprising of two variables) a risk average and a weighted average for all factors to derive a final risk percentage.

*Hypothesis 2:* The South African PGM industry is a competitive industry with a strong competitive platform.

Testing methodology: Porter's five forces analysis was used to determine the strength of the competitive platform and competitive advantages as well as the compilation of a unique competitive index to analyse competitiveness over time.

*Hypothesis 3:* The South African industry has a relatively high development potential.

Testing methodology: The weighted average of development factors was calculated for the industry.

## **4 Data collection**

The Department of Minerals and Energy's (DME) Minerals Bureau (1999, 2000), which formed part of DME's division focusing on mineral promotion, was used as a source to capture qualitative data on production and employment-related issues. Additional quantitative information was captured by means of interviews with producers or industry analysts, in which basic guidelines were used to guide the conversations. The guidelines are reported in Annex 1.

### *4.1 Data analysis and discussion*

*Hypothesis 1:* The PGM industry in South Africa is exposed to moderate risk in terms of markets, production factors, policies and vision.

#### *4.1.1 Industry risk analysis<sup>3</sup>*

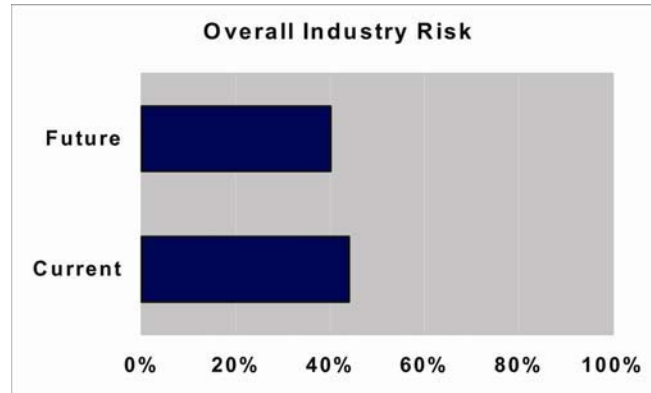
The objective of risk analysis was to ascertain the risk exposure by examining the factors that influence the industry's competitiveness, markets, resources, operating environment and strategies. These factors determine the profitability and future sustainability of the industry.

The methodology that was used for the risk assessment was based on the matrix techniques first used by the Boston Consulting Group in portfolio analysis. The relationships between variables and competitive factors are used to determine the risk. Various matrices, combining different criteria with each variable, were analysed. A risk percentage score of between 80 and 100% was interpreted as very high risk, between 60 and 80% as high risk, between 40 and 60% as moderate risk and below 40% as low risk.

#### 4.1.2 Overall risk

The analysis suggests that the industry is currently exposed to moderate risk (Figure 4). South Africa is responsible for almost 50% of total world PGM production and holds more than 70% of total world reserves. Global demand for platinum jewellery has increased, especially in China, India and the US.

**Figure 4** Overall industry risk



Demand for PGMs has been further stimulated by significant growth in the autocatalyst industry, especially with respect to diesel vehicles. Demand can be expected to continue to grow at high levels and to outstrip supply. As a result, many South African companies are increasing their capacity through various expansion programmes, and most of the new mines are being developed on the Eastern Limb of the Merensky Reef. Furthermore, improved labour relationships have resulted in significant productivity gains over the last few years when measured in terms of output per employee. Although the uncertainty with respect to Russia's stockpiles remains a risk, the risk assessment is expected to improve marginally to lower levels over the medium term, as local producers are expected to become more prominent in the market.

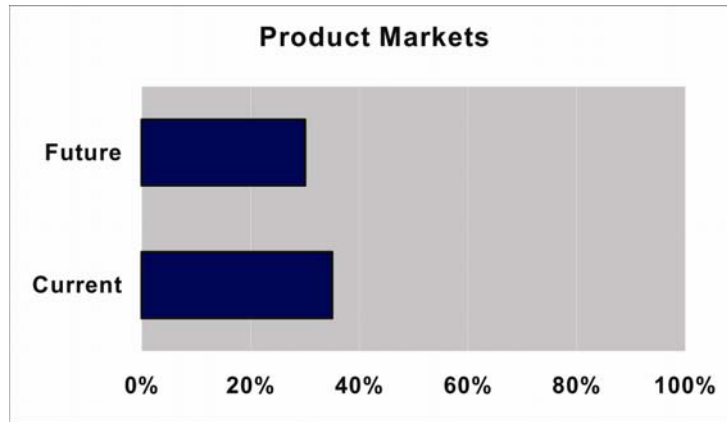
#### 4.1.3 Product market risks

Only the international (export) market is examined, since exports account for 90% of total sales.

Increased demand for jewellery and autocatalysts are the principle factors behind the relatively low risk rating (Figure 5). South African producers have been at the mercy of Russian marketers and the erratic supply of palladium from this source. Russia's impact is diminishing as their stockpiles decline, and a more stable market is expected in the future, with South African producers expect to regain leadership in world markets.

Future risk is expected to improve since Russia's stockpiles are diminishing, South African producers are expanding to increase volume output, platinum jewellery demand is increasing and environmental concerns will stimulate the demand for autocatalysts.

**Figure 5** Product market risk

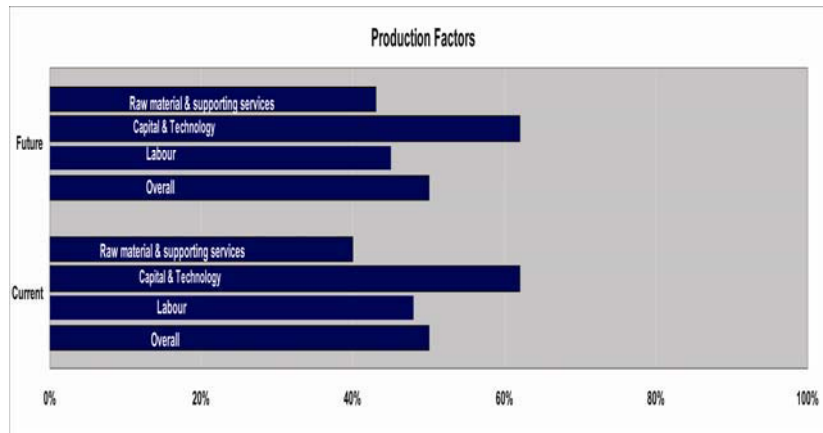


*4.1.4 Production factors*

The industry is exposed to moderate risk for raw materials and supporting services. The overall quality of raw materials is relatively good and the supplier relationships are excellent. The future risk is also expected to remain moderate.

The current relatively high risk rating for capital and technology is attributed to the high-level of technology used at the refineries and the need for the continuous improvement thereof (Figure 6).

**Figure 6** Production factor risks



Local companies spend more on marketing the final value added product than on research and development. Mintek is currently playing an important role in the development of new technology, which is expected to remain an important part of the PGM business in a competitive environment. The PGM deposits depend upon mining and metallurgical developments for their exploitation. Mining is already taking place at depths of 2 km. Given the efforts by Miningtek at the CSIR research organisation to investigate the

potential for mining gold at greater depths than 4 km, there is no reason to believe that such developments could not be applied to platinum mines. Hence, the current acceptance of a cut-off of inferred resources at 2 km need not to be applicable in the future. There is no reason to suppose that economic grades of PGM content will not continue to greater depths.

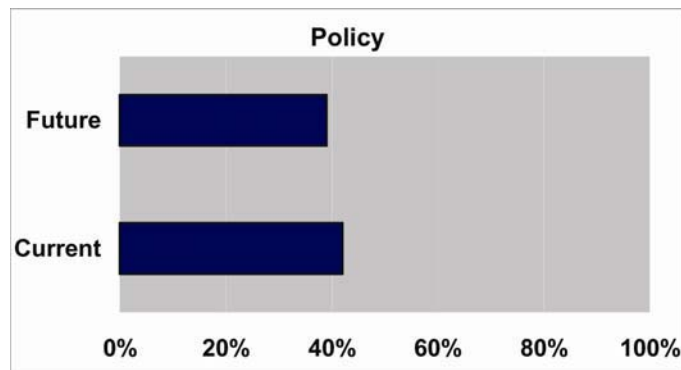
The moderate risk rating for labour is due to the significant improvement in labour relations since 1996. The industry was hampered by low productivity and the subsequent negative impact of industrial action on production costs. Worker relations, productivity and stability have improved as a result of the introduction of incentive schemes, flatter structures, self-motivating work teams and productivity-linked wage increases. Most companies are introducing safety awareness programmes and specialised training programmes to ensure the appropriate development of their workforces.

Overall, the current risk for production factors is moderate and it is expected to remain moderate over the medium term.

#### 4.1.5 Policy

The moderate policy risk rating is due to the positive effect of anti-pollution laws and stringent exhaust gas standards that are currently being implemented (Figure 7). The depreciation of the Rand during the early 2000s and subsequent price increases resulted in extra revenues from the PGM group of metals.

**Figure 7** Policy risk

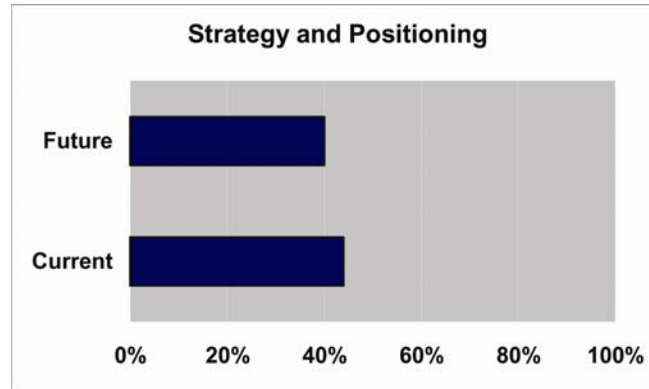


On the downside, mining operations are monitored more closely than before for pollution and rehabilitation plans, which must be submitted before operations commence, with a consequent increase in operating costs and decrease in project returns. It is also important to note the negative impact of the Rand appreciating against the US dollar, which will have a significant effect on revenues, especially when prices are weakening. The future policy risk is expected to decline, since anti-pollution laws in the US and the European Union are expected to become more stringent, thus stimulating demand for autocatalysts and therefore PGMs. The implementation of the new Minerals Bill, which was passed in 2005, is anticipated to have a positive effect on the policy environment, since more groups will be allowed to mine and prospect.

#### 4.1.6 Vision, strategy and positioning

The moderate risk rating associated with management strategy and positioning is attributable to the increased pipeline and industry cooperation (Figure 8).

**Figure 8** Strategy and structure risk



Partnering between suppliers and consumers is developing, and the close cooperation between the various role players is aimed at defining better and more consistent rates of delivery, guaranteed sales for the supplier and lower unit prices for the purchaser. Furthermore, the Platinum Guild International, initiated in 1975, actively promotes platinum as a raw material for jewellery and coins. Various mines have subsequently joined to contribute to the current success. The future risk is expected to be low, since cooperation is expected to improve further.

The various expansion plans mentioned earlier are summarised in Table 1.

**Table 1** Planned expansions

<i>Western Limb</i>	<i>Oz '000/year</i>	<i>Western Limb</i>	<i>Oz '000/year</i>
Pandora	400	Maandagshoek	200
Karee and Eastern Pt.	300	Dwarsrivier	170
Waterval and Union	485	Winnaarshoek	175
Rasimore	250	Messina	30
Aquarius	150	Sperrylite	NA
Maroelabult	50	Kennedy's	NA

Most of the expansions on the Eastern Limb are by either Implats or Amplats, and both are involved with empowerment groups via joint ventures. Local producers are currently using their large reserve base, the Merensky Reef, as their competitive advantage to gain market share through these expansions.

The in-depth analyses clearly indicated the viability of Hypothesis 1 that the PGM industry in South Africa is exposed to moderate risk in terms of markets, production factors, policies and vision. The various risks impacting on the industry and its operating environment are limited and are quantified only as moderate. The industry should thus be developed even further to ensure its competitive sustainability.

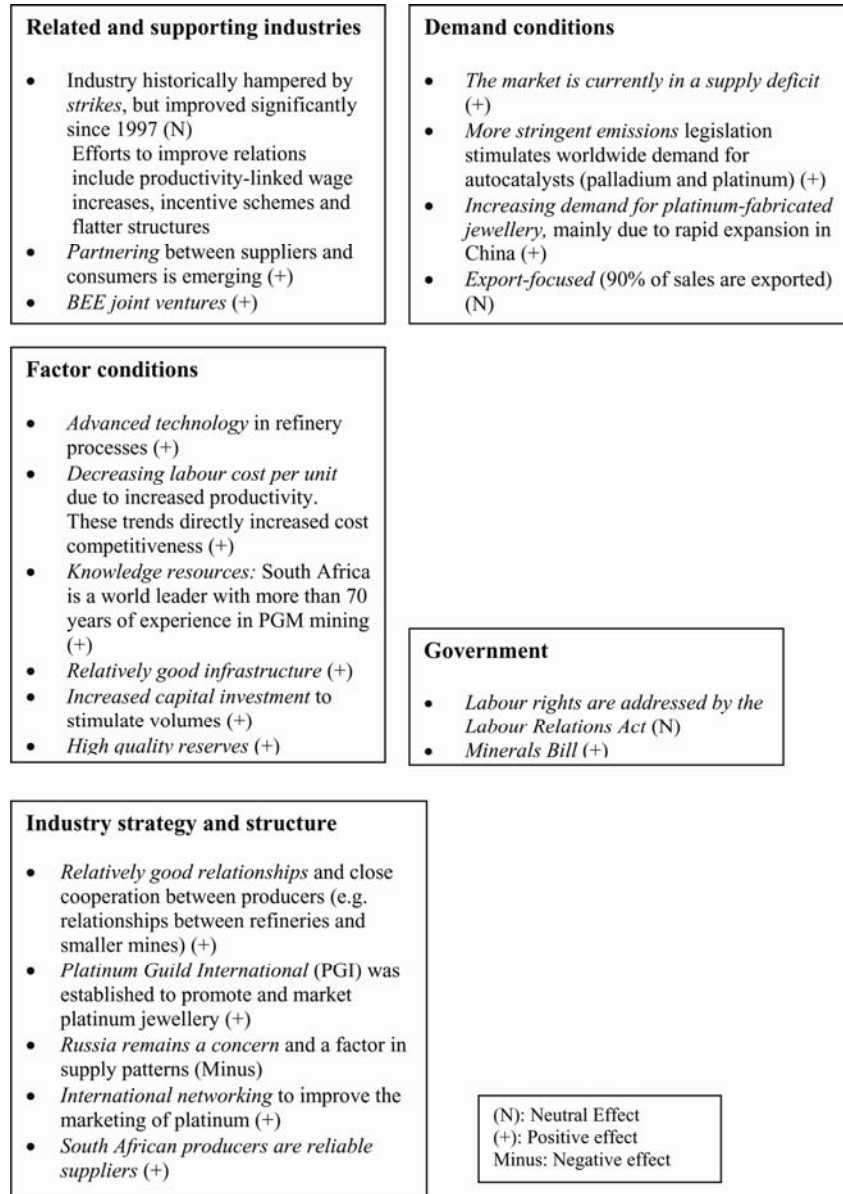


*Hypothesis 2:* The South African PGM industry is a competitive industry with a strong competitive platform.

Porter’s framework of competitiveness provides an efficient assessment methodology for determining the strength of the diamond and its various components.

The various forces impacting on the industry’s competitiveness, as described by Porter, are discussed and the results of the assessment are summarised in Figure 9.

**Figure 9** Forces impacting on the competitiveness of the PGM industry



#### *4.1.7 Factor conditions*

South African producers are experienced and are successful not only at the mining but also in the development of new technologies, especially in refinery processes. However, the main competitive advantage is the rich mineral endowment of the country, with special emphasis on the Merensky Reef in the Bushveld Igneous Complex.

#### *4.1.8 Demand conditions*

The market is currently in a supply deficit. More stringent emissions legislation stimulates the demands for autocatalysts worldwide. There is also increasing demand for platinum-fabricated jewellery, mainly due to rapid expansion in China and India, which will further stimulate demand conditions.

#### *4.1.9 Government*

The government is actively involved in the creation of a more competitive mining industry in South Africa not only through its regulatory role but also through its promotional and developmental role in the South African economy.

#### *4.1.10 Related and supporting industries*

The industry was historically hampered by strikes, but the situation has improved significantly since 1997. Efforts to improve relations include increase in productivity-linked wage, incentive schemes and flatter management structures. Partnering is emerging between the local chrome mines in the Rustenburg region and the platinum producers, as some of the chrome producers are starting to extract chrome from the dumps at nearby platinum mines.

As a result of the high density of platinum producers active in the Rustenburg region, an effective and well-established supporting environment has developed in the area to increase the efficiency of the overall PGM industry. Increasing numbers of ventures between suppliers and consumers are emerging to further develop an effective support structure.

#### *4.1.11 Industry strategy and structure*

South African producers are classified by the market as reliable suppliers with a clear vision to grow the PGM market. The local industry is pro-active in its efforts not only to save costs but also to further develop a world-class competitive platinum industry in South Africa. Increased cooperation between large players and an overall shift towards partnering strategies, especially with smaller empowerment groups, are evident. Partnering strategies not only include the development of new projects with empowerment groups but also partnering between the larger producers via shared capital and development costs.

Various initiatives to stimulate demand for platinum producers are being implemented, especially in the jewellery sector. These strategies will not only increase the demand but will also emphasise South Africa's dominance in the global PGM playing field.

The structure of the industry is also changing as a result of the various groups entering the platinum sector in South Africa. The industry is expected to become more competitive in future, although increased cooperation will still be evident.

The industry has a very strong supporting environment in terms of its physical characteristics, for example, in terms of its reserve base, infrastructure, knowledge and marketing experience. Furthermore, demand conditions are strong and are led mainly by the autocatalyst industry. South African producers have a strong international presence and are regarded as reliable suppliers with a clear strategy. Government is actively involved in the establishment of an investor-friendly environment, while partnering strategies with empowerment groups are becoming increasingly evident. Hence, research on the competitiveness of the PGM industry in South Africa has proved its viability. Consequently, the hypothesis that the South African PGM industry is a competitive industry with a strong competitive platform was accepted. The competitiveness of the industry is sustained through continuous development of the industry based on a strong competitive platform.

*Hypothesis 3:* The South African industry has a relatively high development potential.

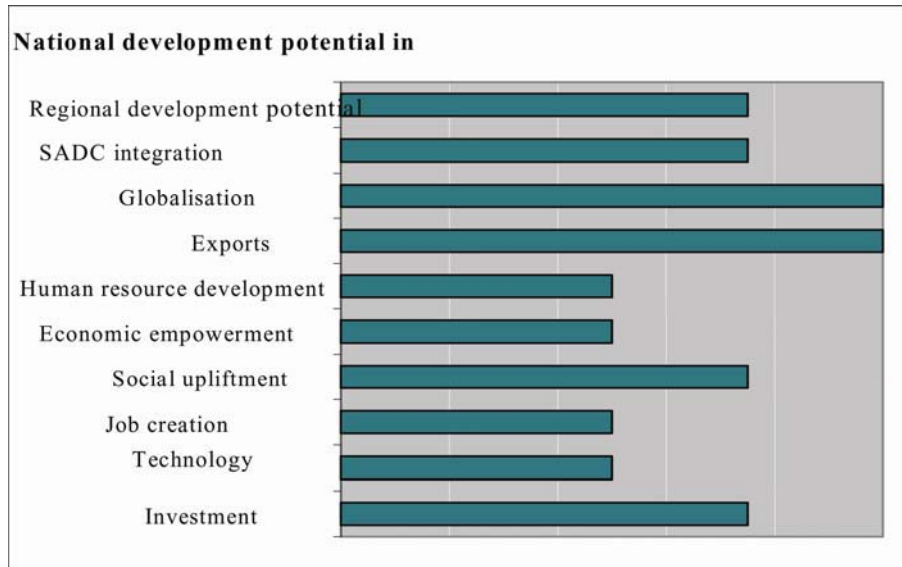
The overall development potential of the PGM industry was analysed with regard to South Africa’s NPO and the industry’s relative fit. Figure 10 shows the development potential assessment, NPO and the criteria description. The results of the analysis show a 76% overall alignment between NPO and industry.

**Figure 10** Development potential assessments of the South African PGM industry, National Policy Objectives and criteria description

NPO	Critical value	First Quartile (=1) Critical value	Second Quartile (=2) Critical value	Third Quartile (=3) Critical value	Fourth Quartile (=4) Critical value	Fifth Quartile (=5) Critical value	Total (%)	Criteria description	
Promote and sustain a high rate in mining	0	0.16	0.26	0.33	4	0.52	infinity	80	Capital/output ratio
Promote and sustain employment creation	0	1.6	1.8	3	2.2	3.3	infinity	60	Employment multiplier (total) Unskilled and lower skilled jobs as a percentage of total work force
Eradicate poverty and social upliftment	0%	20%	40%	60%	4	80%	100%	80	
Black economic empowerment	0%	20%	40%	3	60%	80%	100%	60	Percentage of companies involved with empowerment
Promote and sustain export orientation	0	4.7	10.5	15.2	37.0	5	100	100	Export propensity
Encourage investment in appropriate technology	none		average	3	average		High	60	
Encourage development in human resources	0%	2%	4%	3	6%	8%	10%	60	Percentage of turnover spent on education and training
Promote globalisation of industrial development	Zero		average	average		5	High	100	
SADC: Trade integration and development	zero		average	average	4		High	80	Potential trade or investment links with SADC.
Regional development potential	0%	20%	40%	60%	4	80%	100%	80	Percentage of current companies located in SDI's
<b>Total NPO alignment (%)</b>								<b>76</b>	<b>Average to high</b>

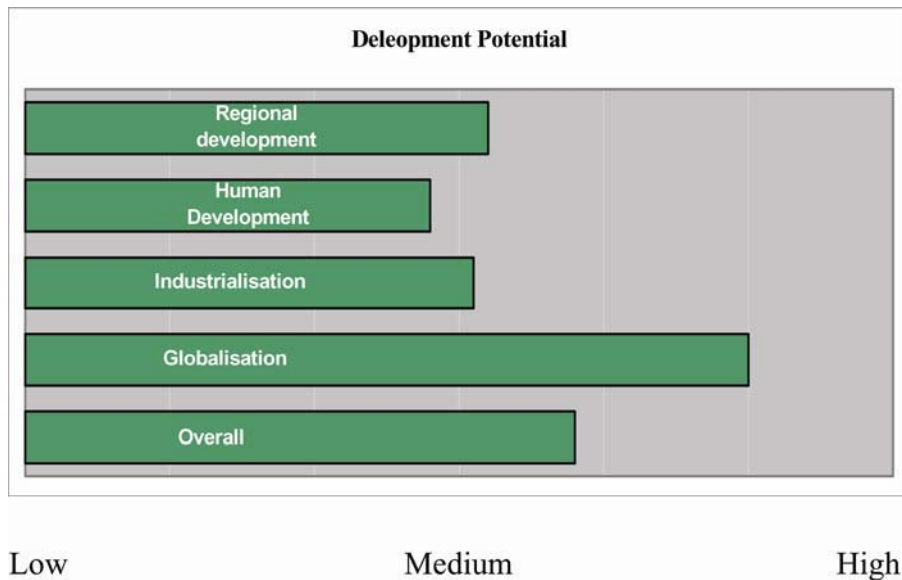
The development potential for various factors (namely, investment, technology, job creation, social upliftment, economic empowerment, human resource development, exports, globalisation, Southern African Development Community (SADC) integration and regional development potential) is shown in Figure 11.

**Figure 11** Development potential of the South African PGM industry



The industry has a high development potential (Figure 12), which it is important to pursue in order to ensure the upliftment of the South African workforce.

**Figure 12** Development potential of the South African PGM industry



Low

Medium

High

#### *4.1.12 Industrial potential*

Strong forward and backward linkages to the South African economy, coupled with some potential for downstream development, contribute to an average rating for industrialisation potential.

Expansions had already commenced during 2001, mainly to ensure increasing output volumes since demand outstrips supply. Highly sophisticated and specialised technology is used in the refinery process. South Africa is a world leader in the development of such technologies.

#### *4.1.13 Globalisation potential*

The high rating is mainly due to the strong export focus of the South African industry (97.2% of total sales are in the export market). Producers are also focusing increasingly on the downstream development specifically of the platinum industry. Further, global integration is achieved by the increasing number of international investors active in South Africa.

#### *4.1.14 Regional development potential*

The above average rating is mainly due to the infrastructure developments by the larger players in rural areas. The SADC region is also exploited by local producers, especially the exploration and mining activities in Zimbabwe, which is witnessing some political unrest.

#### *4.1.15 Labour development potential*

The rather low potential for future job creation is mainly due to the limited number of jobs that are expected to be created by future expansions. The industry has a rather low employment multiplier. Unskilled and lower skilled jobs account for the major part of the workforce. Further limited opportunities for empowerment exist, and only a few empowerment initiatives are in place. Two large players dominate the industry. Most of the companies have adopted a developmental role through increased training and development programmes.

Research on this hypothesis proved its viability. Consequently, the hypothesis is accepted. The development potential of the industry was quantified to indicate the different variables or areas of research that contribute to the overall development of the industry and its ability to change South Africa in terms of social upliftment.

## **5 Conclusions**

The South African PGM industry is a competitive industry with a strong competitive platform. The competitiveness of the industry is sustained through continuous development of the industry based on a strong competitive platform. However, the industry risk is medium to moderate for the various factors studied. The local PGM industry has a relatively high development potential. The development potential of the industry was quantified to indicate the various variables or areas of research that

contribute to the overall development of the industry and its ability to change South Africa in terms of social upliftment.

These findings have implications for the expansion programmes (exploitation and exploration) of the players in the industry not only in South Africa but also metal industry players in countries like India who are eyeing global resources for acquisition, while the commercialisation of fuel cell technology is likely to have a considerable effect on the demand and supply situation and hence the risk in the industry. The results of the study will assist industry players, decision-makers, analysts and policy makers not only in South Africa but also across the globe to gain a better understanding of the industry and will enable them to make appropriate investment decisions which will stimulate and develop local industry to full potential and likely to attract foreign investment to South Africa.

The PGM industry has been researched from various perspectives. These analyses were mainly focused on financial risks with special emphasis on returns, equity or debt financing as well as profitability analysis. Producers are conducting their own research on demand and supply. However, no research in the past focused on the analysis of the local PGM industry in terms of risks, competitive drivers, the environment and development potential. The paper has applied management theories to mining situation in analysing the Platinum Group of Minerals (PGM) competitiveness in South Africa which is unique. South Africa has witnessed dramatic social transformation during the last 10 years. Implication of HIV/AIDS, BEE, and changes to notional mineral policy may be future direction of research in analysing the competitive position of the PGM industry of South Africa.

The following are the limitations of this study:

- 1 Various producers were interviewed to gain a full understanding of their processes, markets strategies and future investment opportunities. The final analysis was based on the consolidated findings of the overall industry, which might not reflect individual producer's situation. Therefore, the analysis could be interpreted as a generalisation. However, it has been proved from similar studies in mining industry that the same risks and environmental forces face producers.
- 2 Primary data source was the Minerals Bureau (1999, 2000) of DME. They depend on the accuracy of monthly surveys completed by various mines. Many of these surveys were either not completed or lost, thus forecasts and adjustments had to be made.

### **Acknowledgements**

The views expressed in this paper are our own. We thank anonymous referees for their constructive and helpful comments that have improved the value of this paper.

### **References**

- DME (Department Minerals and Energy) (2005) *South Africa's Mineral Production and Sales 1985–2004*. Pretoria: Report no 50. DME. (Online) Available at [www.dme.gov.za](http://www.dme.gov.za). Accessed on 23 March 2006.
- Du Plessis, E. (2001) 'Global competitiveness: only survival strategy for South Africa', *Management Today*.

- Ferreira, A. (2000) 'Business strategy: having to cope with waves of change', *Management Today*, Vol. 16, p.11.
- Grant, R.M. (1998) *Contemporary Strategy Analysis*. Oxford: Blackwell Publishers.
- Henderson, B.D. (1989) *The Origin of Strategy*. Boston, MA: Harvard Business School.
- Hill, C.W.L. (2000) *International Business – Competing in the Global Marketplace*. University of Washington.
- Holden, M. (1994) *Trade Policy and Industrial Restructuring in South Africa*. Mimeograph.
- IDC (Industrial Development Corporation) (1997) *Provincial Industrial Development in South Africa*. Sandton.
- IDC (Industrial Development Corporation) (1998) *Provincial Industrial Development in South Africa*. Sandton.
- IDC (Industrial Development Corporation) (1999) *Provincial Industrial Development in South Africa*. Sandton.
- IDC (Industrial Development Corporation) (2000) *Annual Report 2000*. Sandton.
- Green, G.R. and Beckman, B.A. (1992) 'The composite index of coincident indicators and alternative coincident indexes', *Survey of Current Business*, Vol. 72, pp.42–45.
- Johnson, M. (2005) Available at: [www.matthey.com/](http://www.matthey.com/). *Mining Journal*. 2003. 'Rand Slows Anglo Platinum Expansion' (p.4).
- Minerals Bureau (1999) South Africa's Mineral Industry 1998/99. Department of Minerals and Energy.
- Minerals Bureau (2000) South Africa's Mineral Industry 1999/00. Department of Minerals and Energy.
- Mohr, P. and Fourie, L. (2000) *Economics for South African Students* (2nd ed.). Pretoria: University of South Africa, Van Schaik.
- Mohr, P. and Fourie, L. (2004) *Economics for South African Students* (3rd ed.). Pretoria: University of South Africa, Van Schaik.
- Platinumfor.net-Key figures-Supply (2005) (Online) Available at <http://www.platinuminfo.net>. Accessed on 24th March 2006.
- Platinum Today available at <http://www.platinum.matthey.com/>
- Platinum and Palladium Review for 2000–2006 (interim) (Online). Available at <http://www.platinum.matthey.com/publications/1132062873.html>
- Porter, M.E. (1990) *The Competitive Advantage of Nations*. London: Macmillan.
- SAMI (South Africa's Mineral Industry) (2004–2005) Pretoria DME. (Online) Available at: [www.dme.gov.za](http://www.dme.gov.za). Accessed on 28th November 2006.
- Swanepoel, B.J., Erasmus, B.J., van Wyk, M.W. and Schenk, H.W. (1998) *Human Resource Management – Theory and Practice*. Cape Town.
- Unger, M. (1996) 'Effective investment and competitiveness', in G. Maasdorp (Ed.), *Can South and Southern Africa become Globally Competitive Economies?* (pp.172–181), London: Macmillan.
- Wilburn, D.R. and Bleiwas, D.I. (2004) Platinum-group Metals – World Supply and Demand. US Geological Survey Open-File Report 2004-1224. (Online) Available at <http://pubs.usgs.gov/of/2004/1224/2004-1224.pdf>. Accessed on 23 March 2006.

## Notes

<sup>1</sup>Primary sources include the production of metals, including byproducts recovery from mines, while secondary sources include all types of recycling.

<sup>2</sup>The Bushveld Igneous Complex is by far the largest layered intrusion in the world. It has the overall shape of a basin, approximately 400 km by 300 km in extent. It is exposed on the surface around its edges. There are three layers in the Bushveld Complex that contain economic grades of PGMs – the Merensky Reef, the upper Group (UG2) Chromitite layer and the Platreef. The former two layers almost always occur together, separated vertically by 20–400 m. The only exception is in the Northern Limb, where only a poorly mineralised Merensky-equivalent is present. The Platreef has been proven only in the Northern Limb. The Eastern and Western Limbs are almost perfect mirror images of one another, both geologically and in terms of mineralisation.

<sup>3</sup>See Annex 2 for the results of the matrix analysis.

## **Annex 1**

### *Guidelines for interviews*

The objectives of the interviews, which were conducted with various analysts, producers and researchers, were to:

- obtain qualitative information with regard to the PGM industry in South Africa
- get objective opinions of the various factors to be investigated
- use the information in relation to quantitative information in the risk assessment development potential analyses and competitive analyses.

### *General issues discussed (only guidelines, to give structure to the interview)*

- 1 Description of the value chain/industry pipeline:
  - raw materials used
  - mining and refinery
  - end uses/applications.
- 2 General conditions over the past year and prospects for the medium term.
- 3 Critical success factors of the industry.
- 4 Sources of competitiveness:
  - reserves, production
  - technology, skills.
- 5 Contribution to development:
  - social upliftment
  - investment
  - job creation
  - involvement in economic empowerment
  - sophistication of technology
  - human resource development (turnover spent on education and training)
  - globalisation, SADC integration
  - spatial development



- 6 Institutional support (government, other institutions)
- 7 Domestic production – trends, capacity utilisation
- 8 Product markets – domestic:
  - price trends, demand trends
  - size/nature of domestic market, market share
  - competition (monopolistic, oligopolistic, free market)
  - market focus, barriers to entry, product differentiation
  - quality (product and service)
  - import competition (growth, penetration, barriers to import)
- 9 Product markets – international:
  - demand growth trends, market size and nature
  - international production trends, export opportunities
  - international prices, pricing
  - international competition (nature), barriers to export, major competitors
  - South African exports (export propensity, export growth, experience, focus, products)
- 10 Production factors – Labour:
  - wages, productivity, skills
  - union activity (industry objectives, labour interest, confrontational)
  - availability of trained workers
  - industry training initiatives
- 11 Production factors – capital goods and equipment:
  - age, nature of equipment
  - investment trends, capital sourcing (domestic, imported or both)
  - R&D expenditure
  - level of international knowledge and transfer
- 12 Production factors – capital financing:
  - utilisation of finance I institutional support
  - gearing
  - availability of custom financial products
- 13 Production factors – raw materials (including, utilities):
  - reliability of suppliers (JIT, delivery methods, long lead times)
  - raw material costs, impact on margins, quality of domestic supply
  - barriers to imports of raw materials
  - impact of environmental factors, supply (sufficient, low)

14 Policy:

- trade policy's impact on production/sales
- industrial policy's impact on production/sales
- monetary and fiscal policy's impact on production/sales

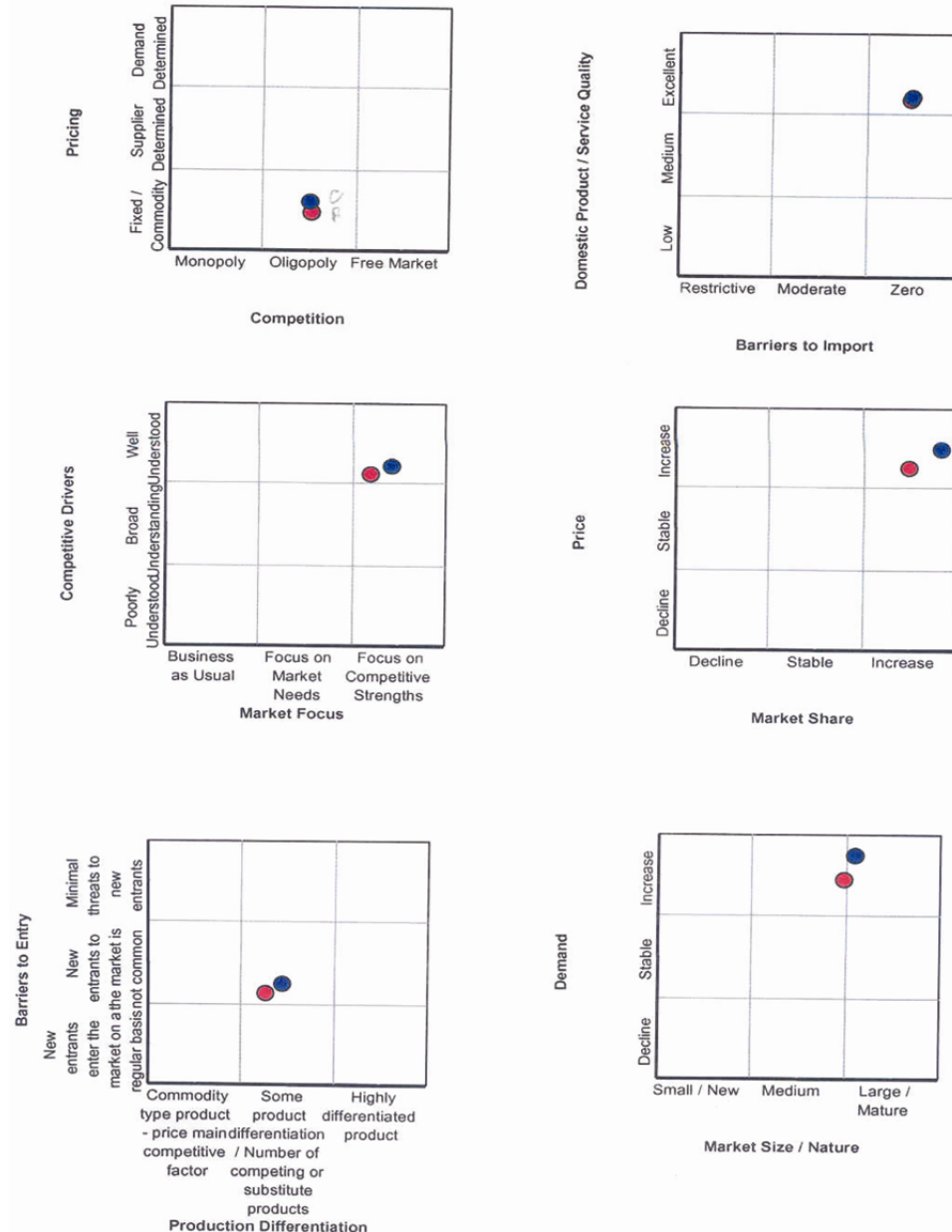
15 Strategy and positioning:

- participative management
- work organisation
- industry organisation/cooperation
- cluster/pipeline cooperation
- supplier relationship
- relationship with buyers

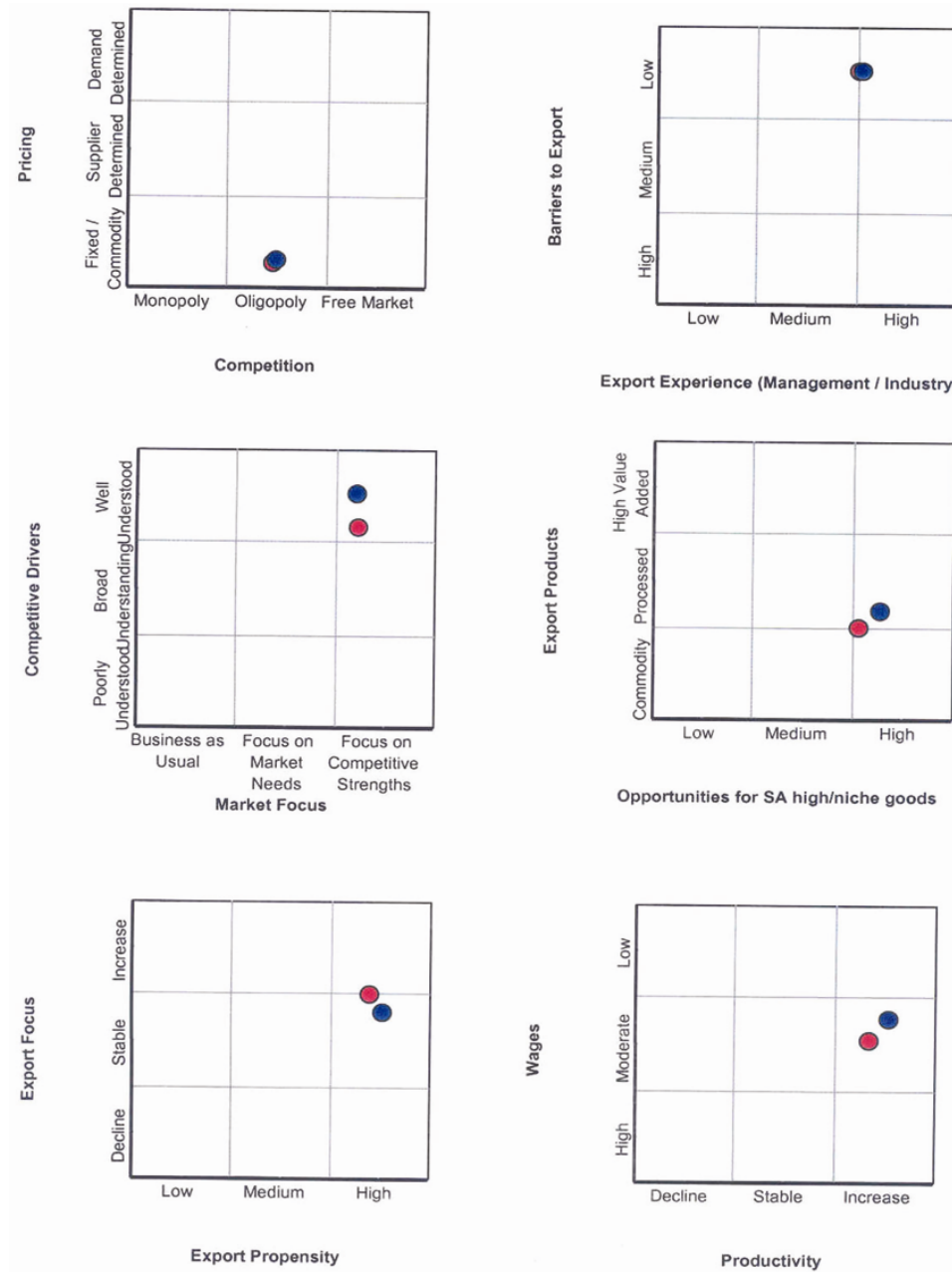
All of the above were discussed with industry experts with regard to the then existing situation and their anticipations for the future (medium term of five years).

**Annex 2: Risk analysis matrices for the local PGM industry**

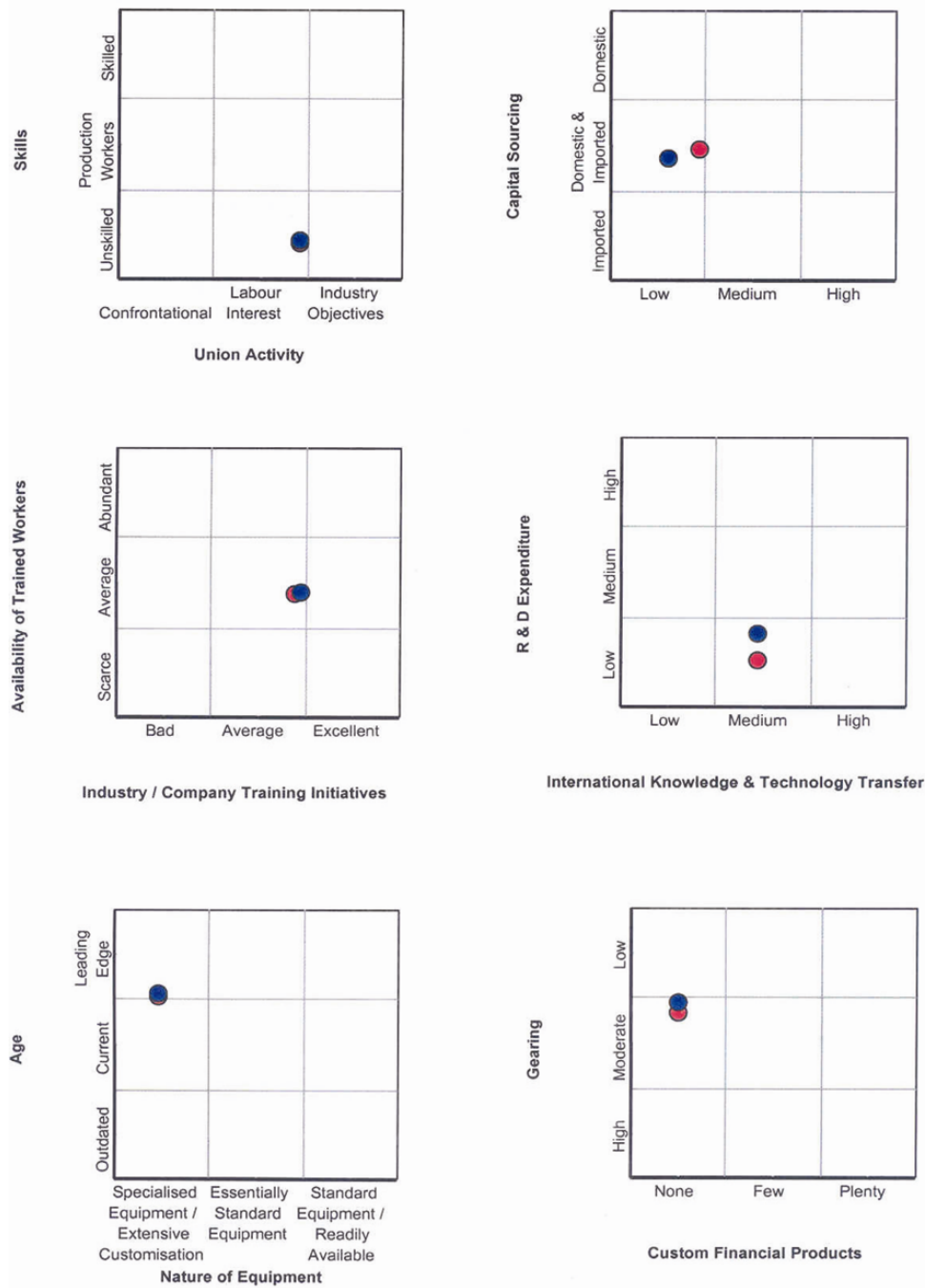
*1 International Product markets (blue=current, red=future)*



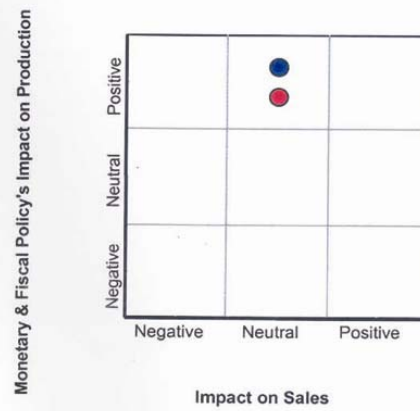
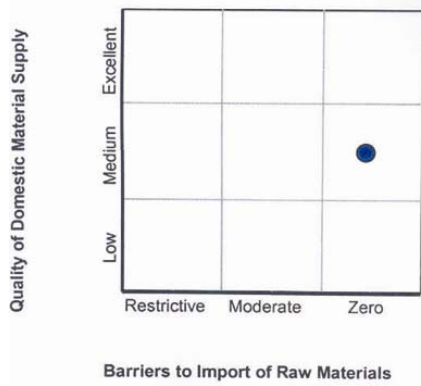
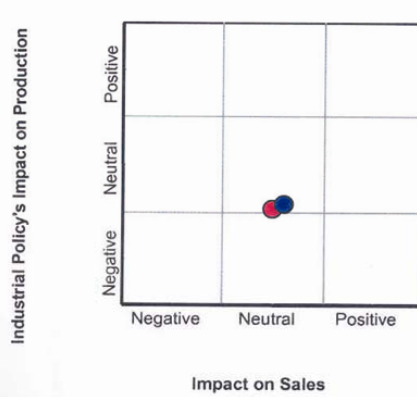
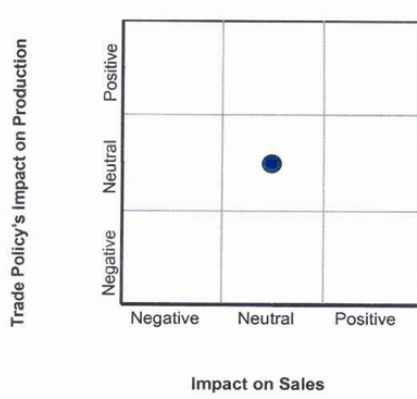
1 International Product markets (continued)



2 Production factors



2 Production factors (continued)



3 Policy, strategy and positioning

