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# A correlation analysis of the effect of internationalisation on the global competitiveness of the South African mining sector

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**University of the Witwatersrand**

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UNIVERSITY OF THE
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JOHANNESBURG

# A CORRELATION ANALYSIS OF THE EFFECT OF INTERNATIONALISATION ON THE GLOBAL COMPETITIVENESS OF THE SOUTH AFRICAN MINING SECTOR

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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.

Johannesburg, 2021

## DECLARATION

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## ABSTRACT

The institutional and macroeconomic fundamentals that affect the development of the local stock market also regulate the ability of domestic companies to internationalise. The integration into the global economy and the liberalisation of these fundamentals might have an asymmetrical effect on the development of domestic markets. Domestic companies are able to access international capital markets, list, and trade on foreign stock markets. These global expansions might result in most companies losing incentives to invest in smaller, unstable domestic markets.

The aim of this research was to do a correlation analysis of the effect of internationalisation on the South African mining sector's ability to sustain its global competitiveness. The research focused on the mining sector's ability to maintain its market share, maintain steady growth measured by capital expenditure, and maintain its contribution to the national economy. The Spearman rank correlation coefficient was used for the correlation analysis. The period of study was between 2009 and 2018.

The study used market capitalisation as a proxy for internationalisation. The market share proxies were the ores and metals exports as a percentage of the overall merchandise trade, and mining production and sales revenue. Capital spending proxies were the capital expenditure of the mining companies listed on the Johannesburg Stock Exchange and the Statistics South Africa's mining and quarrying capital expenditure. The sector's contribution to the national economy was measured by using gross fixed capital formation and gross value add. The correlation analysis successfully correlated the decrease in market share, capital spending and economic contribution to the decline in market capitalisation. Internationalisation has affected the mining sector's ability to sustain its global competitiveness negatively.

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## DEDICATION

This report is dedicated to my late father, Nehemiah Shima Makoela, you are dearly missed.

To my mother, Albertina Mabothe Makoela, thank you for your wisdom, guidance, and love.

To my wife, Lethabo Jeritah Makoela, thank you for the love, support, and encouragement.

To my daughter, Morongwa and son, Matome, this is all for you.

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## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ARDL | Autoregressive Distributed Lag bound testing |
| BIT | Bilateral Investment Treaties |
| CAPEX | Capital Expenditure |
| EU | European Union |
| FAM | Flexible Accelerator Model |
| 5VARM | Five-variable Vector Auto-Regression Model |
| FDI | Foreign Direct Investment |
| GDP | Gross Domestic Product |
| GFCF | Gross Fixed Capital Formation |
| GMIT | Gravity Model of International Trade |
| GNP | Gross National Product |
| GVA | Gross Value Add |
| ICSID | International Centre for the Settlement of Investment Dispute |
| ITSUR | Iterative Seemingly Unrelated Regression |
| JSE | Johannesburg Stock Exchange |
| MHSA | Mine Health and Safety Act |
| MPRDA | Mineral and Petroleum Resources Development Act |
| MPRRA | Mineral and Petroleum Resources Royalty Act |
| Mt | Million Tons |
| OLS | Ordinary Least Squared |
| RCA | Revealed Comparative Advantage |
| RDP | Reconstruction and Development Program |
| SADC | Southern African Development Community |
| SARB | South African Reserve Bank |
| t | Tons |
| USA | United States of America |
| SAEC | South African Energy Coal |
| StatsSA | Statistics South Africa |

| | |
|---|---|
| US$ | United States Dollar |
| ZAR | South African Rand |
| ZAR bil | South African Rand in billions |

# 1 INTRODUCTION

## 1.1 Background

The ability to compete globally requires countries to use their core competencies to build competitive advantage and to adapt to the globalised business markets that are forever changing. Competitiveness can be defined from at country, sector, and firm level. From a country perspective, competitiveness is also called macro-competitiveness. Macro-competitiveness is defined as a country's ability to realise the central economic policy while maintaining a positive balance of payments *(*Bell*, et al*., 2002). It is measured by the quality and quantity of the products that a country produces and the efficiency with which it produces them (Porter, 1990). Some of the factors that determine the competitiveness of a country include the available factors of production, the demand for products and services, the presence or absence of suppliers and related industries, the regulatory environment that governs how companies are created, organised, and managed (Porter, 1990).

Sectoral level, competitiveness is also called micro-competitiveness. It is the ability of a sector to maintain steady growth in market share while also ensuring satisfactory profits for all firms in the sector (Kudrle, 1996). Porter (1990) described competitiveness at the sector level as the ability to keep the trade balance positive and its share of exports above the national average. This research focused on the sectoral or micro-competitiveness of the South African mining sector. It is defined as the mining sector's ability to maintain its market share, maintain steady sectoral growth as measured by capital expenditure and maintain its contribution to the national economy.

Firm-level competitiveness is a measure of the productivity of an individual firm. The competitiveness of a mining company is a function of its cost of production (Tilton, 1992). Low-cost producers can expand their capacity until their marginal cost of production is equal to the market price. The

additional capacity gives them a competitive advantage over the high-cost producers.

The relationship between the South African exchange control crisis and the adoption of internationalisation strategies by mining companies can be traced back to 1960. Following the 1960 Sharpeville Massacre, the government introduced tight exchange control regulations in 1961 to curb the capital flight crises as most companies started to divest and individuals left the country. In 1962, the United Nations General Assembly imposed economic sanctions on South Africa following the Sharpeville Massacre (Nishiura, 2013). Further trade and financial sanctions were imposed in 1980. A large amount of capital started to flow out of the country as companies reacted to the sanctions. The South African government introduced exchange control regulations to restrict asset and capital outflow in 1961 (Nishiura, 2013). The country also adopted government-subsidised economic reforms that enabled the development of infrastructure and industrial sectors needed by the state, in order for it to be self-sufficient. The subsidised infrastructure and industrial sectors included the development of synthetic fuel manufacturing plants, power generation facilities, communication systems, roads, and ports (Kiss, 2017). The mining, steel and iron industries were heavily funded to ensure that they supplied the economy with the required raw material, employment, income, and steel.

The economic Sanction was uplifted in October 1993 and the exchange control regulations were relaxed in 1997 after the 1994 first democratic elections. The relaxation allowed South African citizens, companies and financial institutions access to international markets and to increase their presence in the Southern African Development Community (SADC) region. Following this easing, five South African companies submitted a request to the exchange authorities to move their primary listing abroad, namely: Billiton, South African Breweries, Anglo American Corporation, Old Mutual Insurance Company Limited and Dimension Data (Walters, S S; Prinsloo, J

W, 2002). The reasons provided by the companies for requesting to list abroad were summarised by Walters and Prinsloo (2002, p. 61) as follows:

- "Easier access to capital resources at a lower cost,
- Opportunities to raise efficiencies by competing head-on with global competitors,
- The chance to escape from the volatility of financing costs in an emerging-market economy, and
- The opportunity to promote foreign investment in South Africa and improve the country's international profile".

The South African exchange authorities approved these requests and allowed the companies to list abroad. According to Walters and Prinsloo (2002), from February 2001 companies could use up to ZAR500 million of their domestic funds to invest in international markets other than Africa. Up to ZAR750 million was allowed for investment in African markets. Companies were also allowed to use their local cash holdings to finance up to 10 percent of the investment outlay in situations where the foreign investment cost exceeded the state-legislated limits. The exchange authorities increased the limit for African investments to ZAR2 billion and the local cash holding investment to 25 percent in 2014 (Manyuchi & Mugabe, 2018)

While some mining companies moved their listings abroad such as Billiton, Anglo American Corporation, Anglo Gold, Gold Fields, and Sasol, most companies kept their Johannesburg Stock Exchange (JSE) listing and began to acquire international assets, while restructuring their South African operations. In the period after South Africa granted its mining companies permission to expand globally, the mining sector benefitted from the sudden capital flow movement, the commodity market super-cycle and the overall catch-up growth observed when countries integrate into the world economy. Figure 1-1 shows the mining sector's gross fixed capital formation (GFCF)

as a percentage of gross domestic product (GDP) between 1995 to 2018. The sector experienced erratic capital flow movements between 2001 and 2005. The de-listing of De Beers from the JSE in 2001 and the subsequent takeover by Anglo American corporations were mostly responsible for the movements. Overall investment grew at an average of 3.5 percent year on year between 1995 and 2008. After the 2008 to 2009 global financial crisis, it seemed that the South African post-liberalisation catch-up growth in the mining sector and the commodity super-cycle honeymoon period had passed. Mining investment growth remained stagnant from 2009 until it fell from 2.25 percent in 2014 to 1.58 percent in 2015. There was a slight growth recovery in 2017, but it fell again in 2018.

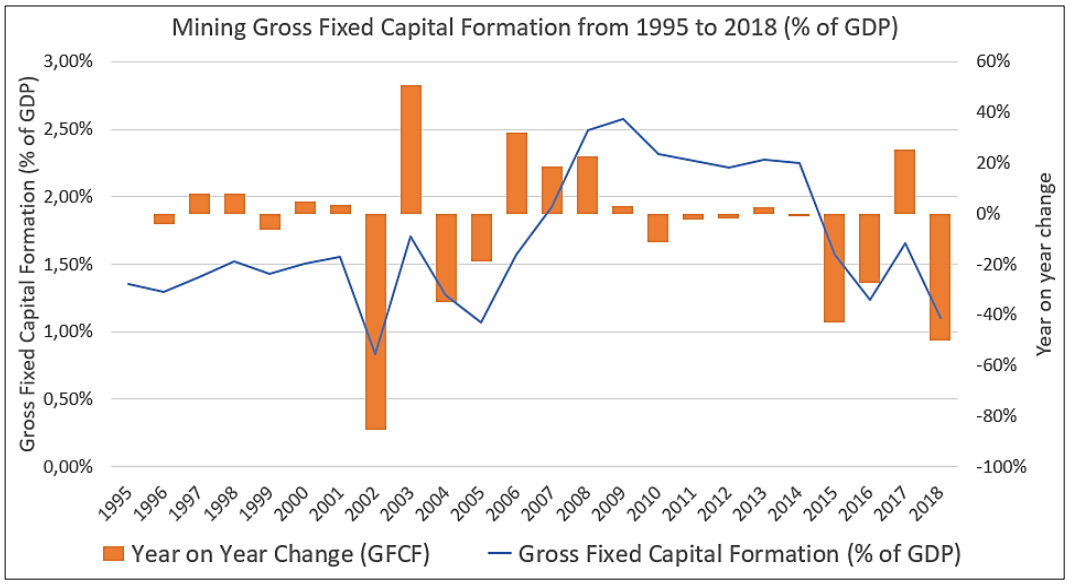



***Figure 1-1: South African mining GFCF from 1995 to 2018 (South African Reserve Bank, 2020)***

The mining sector contributed between 8 percent and 29.33 percent of the total merchandise trade exports of South Africa between 1995 and 2018, as shown in Figure 1-2. Erratic export flows were recorded between 1998 and 2002. These can be associated with the large scale restructuring of the conglomerate structures of most mining companies, followed by international listings and headquarters being moved abroad. The

commodity super-cycle was very profitable for South African ores and metals exports and led to a growth of 3.62 percent year on year between 2003 to 2007. The sector peaked at 29.33 percent of total South African merchandise exports in 2007. However, since the 2008 to 2009 global market crisis, the ores and metals exports contribution has shown an average contraction of 1 percent year on year between 2010 and 2016. The sector recovered slightly in 2017, but the overall trend showed that the country was losing its competitive advantage.

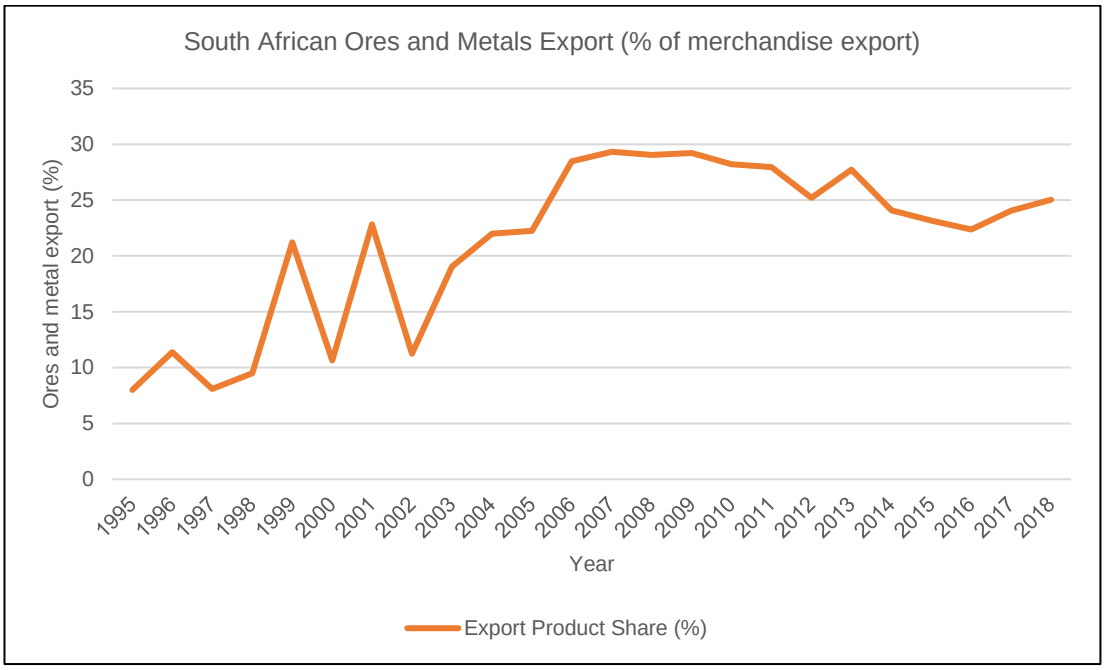



***Figure 1-2: Ores and metals export share as a percentage of South African merchandise exports from 1995 to 2018 (Wits.worldbank.org, 2020)***

The revealed comparative advantage (RCA) index for South African ores and metals is shown in Figure 1-3. The RCA index is the ratio between the country's ore and metal exports and the world's exports of ores and metals. It measures the competitiveness of South Africa in exporting ore and metal relative to other countries exporting the same ore and metals. Between 1995 and 1999, the index grew by 17 percent, and this was the last

significant growth recorded. The overall decline from 1995 to 2018 was 15 percent, and a decline was also recorded during the commodity super-cycle. While the RCA index remained greater than zero, which indicated that South Africa still had a comparative advantage, the decline shows that the sector is losing its overall competitive advantage.

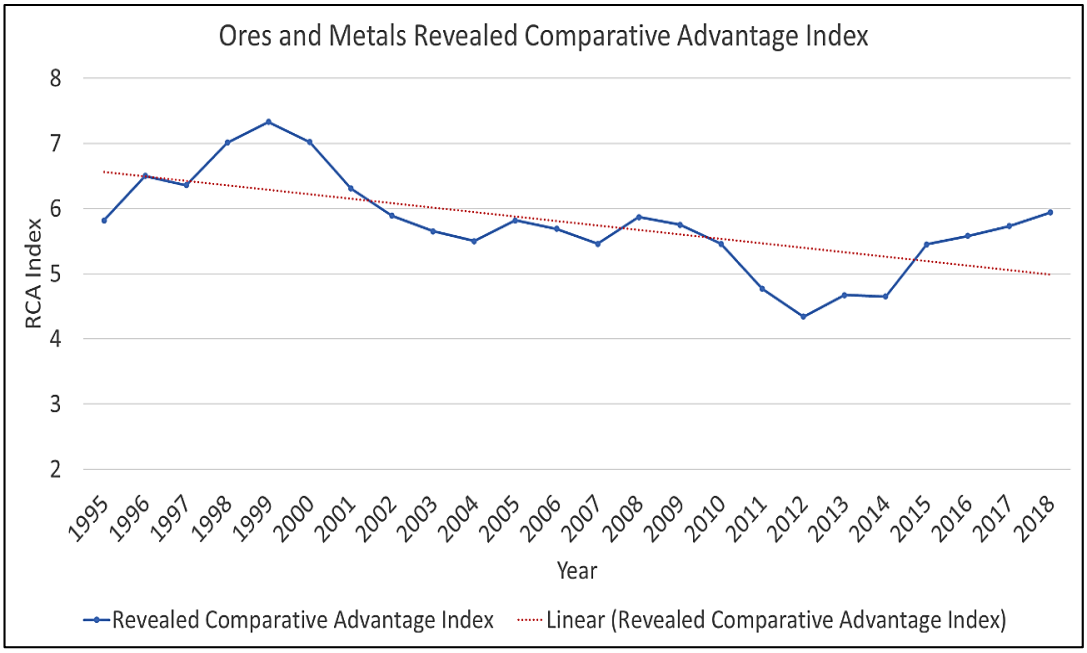



***Figure 1-3: South African Ores and Metals RCA Index (Wits.Worldbank.org, 2020)***

Mohammed (2020) acknowledged that the outflow of capital and the international expansion strategies adopted by most South African corporations resulted in a continuous outflow of capital investment. Nishiura (2013) concluded that the relaxation of exchange controls increased the country's gold and foreign reserves while decreasing employment in the mining and manufacturing sector. The increase in outward direct investment from South Africa exerted pressure on the balance of payments, forcing a downward adjustment of the economy (Mohamed, 2020). This study expands on these arguments from a mining sector perspective.

## 1.2 Research Question

The relaxation of South African exchange controls prompted most mining companies to list on foreign stock exchanges, adopt an internationalisation strategy and transition into multinational mining corporations. These companies kept one or a few operations within South Africa's borders, to maintain their exposure to the South African markets. To shield their profitable and efficient international operations from the operating risks in South Africa, they separated their South African operations from their global assets and left the South African operations cash-constrained and struggling to fund expansion projects (Lane, *et al.*, 2015). This raises the research question:

'How has the internationalisation strategy adopted by South African corporations affected the ability of the mining sector to sustain its global competitiveness?'

## 1.3 Research Aim and Objectives

This research aimed to analyse how the internationalisation strategy adopted by most South African mining companies has affected the mining sector's ability to compete globally. The objectives of the research were to:

- Provide background on internationalisation theories, its determinants, and motives, and how it affects the home country; -
- Review global mining investment trends, motives, and determinants of internationalisation;
- Review the internationalisation of South African companies, and the motives and determinants;

- Provide statistical analysis of the effect of internationalisation on the market share, capital spending and economic performance of the mining sector; and
- Discuss the implications of the findings of the analysis and give recommendations on how to offset the effect of internationalisation.

## 1.4 Motivation for the Study

The South African mining sector plays a vital role in the growth and development of the local economy. Figure 1-1 shows the South African Mineral Reserves and their global ranking by size. In 2017 the country had the world's largest reserves of chrome ore, fluorspar, manganese ore and platinum group metals. It also had: the second-largest reserves of gold and zirconium; the third-largest reserves of nickel and vanadium. With all these reserves, why has the sector's competitive advantage declined? Greater knowledge of internationalisation and the impact on the sector's ability to compete will contribute to a better understanding of the decline in its competitive advantage. This knowledge will enable policymakers to develop trade and investment policies that are best suited to ensuring the growth and development of the South African mining sector.

***Table 1-1: The South African Mineral Reserves and their global ranking by size (Department of Minerals and Energy, 2019)***

| Commodity | Mass | Global ranking by size |
|---|---|---|
| Chrome Ore | 3 100 Mt | 1 |
| Coal | 66 700 Mt | 6 |
| Fluorspar | 41 Mt | 1 |
| Gold | 6 000 t | 2 |
| Iron Ore | 770 Mt | 11 |
| Manganese Ore | 200 Mt | 1 |
| Nickel | 3.7 Mt | 3 |
| PGMs | 63 000 t | 1 |
| Phosphate Rock | 1 500 Mt | 5 |
| Titanium Minerals | 71.3 Mt | 4 |
| Vanadium | 3.5 Mt | 3 |
| Zirconium | 14 Mt | 2 |

## 1.5 Research Limitations

This research had two limitations. The first was the lack of aggregated data on sectoral investment flows. The second was the inadequate reporting of market capitalisation and capital expenditure by some of the JSE-listed mining companies. Without these limitations, the research could have extended the correlation analysis to the various stages of the economic cycle in the South African economy between 1995 and 2018.

## 1.6 Structure of the Research Report

The report is divided into seven chapters:

**Chapter 1: Introduction:** This chapter provided the research background, the problem statement, the research aims and objectives, the motivation for the study, and the sources of data.

**Chapter 2: Framework on Theories of Internationalisation:** This chapter provided the framework for the theories of internationalisation, the motives and determinants of internationalisation, and the effect on the home country.

**Chapter 3: Motives and Determinants of Global Mining Sector Internationalisation:** This chapter reviewed the trend in global mining sector investments and the motives and determinants of internationalisation in the mining sector.

**Chapter 4: Internationalisation in the South African Context:** This chapter reviewed the relationship between South Africa's investment policy framework and internationalisation. It also examined the flow of foreign direct investment (FDI) through South African mining companies and their internationalisation strategies.

**Chapter 5: Research Methodology:** This chapter describes the source of data, the variables and the analysis techniques used in the research.

**Chapter 6: Results Analysis and Discussion**: This chapter presented the results and provides the empirical analyses and a discussion of the results.

**Chapter 7: Conclusions and Recommendations:** This chapter summarised the main findings of the research, provides recommendations and suggests the scope for future research.

# 2 FRAMEWORK OF THEORIES OF INTERNATIONALISATION

## 2.1 Chapter Overview

The aim of this chapter is to provide a literature review on the theoretical framework of internationalisation. The term internationalisation is defined as the process by which a company gradually increases its international footprint by establishing operations in foreign markets (Johanson & Vahlne, 1977). Companies internationalise to increase their market share and maximise their net profit margin while minimising risk exposure to endogenous economic shocks associated with operating in a single country (Mtigwe, 2006). This research study used the terms internationalisation and outward FDI interchangeably. FDI refers to the category of international investment whereby a resident entity of one economy obtains lasting interest and control of a company in another economy, in order to exert a significant degree of influence on the management of that enterprise (United Nations Conference on Trade and Development, 2007). The company must hold over 10 percent of common stock and voting rights to be considered a foreign direct investor (Nishiura, 2013).

In perfect markets, traditional trade theories such as Adam Smith's theory of absolute advantage, David Ricardo's comparative advantage theory and the Heckscher-Ohlin factor proportion theory would have provided enough context to formulate the theoretical foundation for why companies internationalise. However, the international markets operate in imperfect markets and the reasons for internationalisation are mostly based on the interactions between the supply and demand factors that affect the international markets and the individual company's internal and external factors. These interactions make it difficult to group the motives of internationalisation into a single theoretical concept (Trapczynski, 2013). The literature provides a few theories to explain why companies establish

operations in foreign markets. These theories are categorised into economic and behavioural approaches.

## 2.2 Economic Internationalisation Theories

Economic internationalisation theories include models such as Dunning's Eclectic Paradigm, the Resource-based Theory, the International Product Life Cycle model, and the Transaction Cost Theory. The economic approach considers internationalisation as a series of static investment decisions that are based on efficiency consideration and cost (Hermannsdottir, 2008). These decisions are influenced by internal and external factors as summarised in Table 2-1**.**

***Table 2-1: Internal and external factors that influence economic internationalisation theories (Seifert & Machado-da-Silva, 2007, p. 42)***

| **Internal factors** | **External factors** |
|---|---|
| • Ownership advantage<br>• Tacit knowledge<br>• Product characteristics<br>• Communication ability | • Location advantage<br>• Comparative advantage<br>• Industry characteristics<br>• Uncertainty<br>• Government intervention and opportunism |

### 2.2.1 Dunning's Eclectic Paradigm

Most of the literature recognised Dunning's Eclectic Paradigm as the most comprehensive theoretical approach to explaining internationalisation processes (Trapczynski, 2013). John H Dunning introduced the paradigm at the 1976 Nobel Price Symposium. It was based on earlier research studies done by Rastas in 1948 and Frankel in 1955, which found that the United States of America's (USA) manufacturing companies operating in

the United Kingdom had labour productivity that was two to five times higher than their United Kingdom counterparts (Dunning, 2001; Sharmiladevi, 2017). Dunning proposed a three-legged eclectic paradigm that integrated explanatory approaches (such as the firm's comparative advantage) with macro-economic approaches (such as the political economy, production costs and tariff barriers of the foreign country) into a single framework (Tolentino, 2001; Hermannsdottir, 2008; Ribau *et al*., 2015). According to the paradigm, the decision by firms to enter a foreign market and their mode of entry are determined by ownership-specific (O-) advantages, location-specific (L-) advantages and internalisation (I-) advantages (Hermannsdottir, 2008).

The ownership advantages relate to the ability of the company to use its tangible assets (technology, machinery, physical structure) and intangible assets (brand image, management skills) to gain a competitive advantage over its foreign competitors (Ribau, *et al*., 2015). Location-specific advantages refer to reaping the benefits of producing in a foreign location, such as cheaper labour and lower production costs. Internalisation advantages refer to a company's ability to use its ownership advantages to establish production operations in foreign markets, rather than to seek local distributors. Factors such as risk control, return on investment and resource availability are the main internalisation advantages that drive most expansion strategies (Ribau, *et al.*, 2015).

### 2.2.2 Resource-based Theory

The Resource-based Theory of internationalisation expanded on the economic approach concept. The theory claimed that every firm has its own set of heterogeneous resources that play a critical role in developing and implementing a firm's strategy (Barney & Arikan, 2006). Edith Penrose introduced the Resource-based Theory in 1959. She postulated that, by assuming a simple production function that is controlled by supply and

demand conditions, the firm's heterogeneity is central to creating a competitive advantage (Thompson & Wright, 2005). This view was further expanded into the Resource-based Theory by Porter and Wenerfelt in 1980, Rumelt in 1984, Barney in 1986 and 1991, and Grant in 1991.

The Resource-based Theory argued that the company's resources and capabilities limit its ability to develop new products and enter new markets (Grant, 1991). Resources are the company's tangible and intangible assets. Tangible assets are resources that can be measured, traded, and reproduced, including financial, physical and human capital. Intangible assets include property rights, customer networks, suppliers, government organisations, market reputation, and organisational and technical expertise (Barney & Arikan, 2006). Grant (1991) defined a company's capability as the effective cooperation and coordination of its tangible and intangible resources to maximise efficiencies. Capabilities are the attributes that enable a company to exploit its resources (Barney & Arikan, 2006).

The other traditional economic approaches include the International Product Life Cycle Model and the Transaction Cost Theory. The International Product Life Cycle Model argued that internationalisation is a series of incremental steps that are driven by low production and labour costs. These steps are (Hermannsdottir, 2008; Trapczynski, 2013):

- Stage 1: introducing the product to the foreign market;
- Stage 2: growing the demand in that market while relocating production activities into that foreign market; and
- Stage 3: complete relocation of all production activities into the foreign market.

The Transaction Cost Theory also called the Internalisation Theory, argued that companies internationalise to reduce the overall cost of exporting their

goods into that market. The theory assumed that the company has developed sophisticated intangible assets that make it cheaper to produce its goods in a foreign market.

### 2.2.3 Shortcomings of the Economic Approach

The economic internationalisation theories have been widely criticised for being static and overly simple, and for misrepresenting reality (Mtigwe, 2006). Dunning's Eclectic Paradigm has been criticised for being stagnant and not acknowledging the inter-relationships among the determinant factors of internationalisation (Dunning, 2001; Ribau *et al*., 2015). The International Product Life Cycle Theory has been widely criticised for failing to consider born global companies and other modes of access to foreign markets. The Transaction Cost Theory has been criticised widely for failing to acknowledge the effect of the complex web of transaction cost and value-adding activities on the decision to internationalise (Mtigwe, 2006).

## 2.3 Behavioural Internationalisation Theories

On the other hand, the behavioural approach, also called the process approach, argued that internationalisation is a series of decision-making steps that are guided by incremental learning and experience (Anderson, 2000). According to Seifert and Machado-da-Silva (2007, p. 42), the behavioural approach defined internationalisation as "a sequence of acquisition steps taken as the company gains experience and knowledge about foreign markets through a gradual commitment of resources and learning by doing". In contrast, the economic approach linked internationalisation to business rationality, profit maximisation and skill availability. The behavioural approach recognised that rationality has limits. It argued that the decision-maker's behaviour guides the internationalisation strategy of a company, based on its knowledge, perceptions, opinions, and beliefs about a foreign market (Seifert & Machado-da-Silva, 2007;

Hermannsdottir, 2008). This behaviour is influenced by a range of internal and external factors as summarised in Table 2-2.

***Table 2-2: Internal and external factors that influence the behavioural approach of internationalisation theories (Seifert & Machado-da-Silva, 2007, p. 42)***

| Internal Factors | External Factors |
|---|---|
| • Experiential knowledge<br>• Learning by doing | • Psychic distance<br>• Geographic distance<br>• Cultural difference<br>• Inter-organisational networks |

### 2.3.1 Uppsala Model of Internationalisation

The Uppsala Model is based on the research done by Johanson and Wiedersheim-Paul in 1975 and Johanson and Vahlne in 1977. The model claimed that internationalisation is an incremental process of accumulating resources in the foreign market as the company's experiential knowledge increases (Trapczynski, 2013). Johanson and Wiedersheim-Paul (1975, p. 307) identified four steps taken by companies when developing operations in foreign countries, which are:

- Step 1: no regular export activity;
- Step 2: export via independent agents;
- Step 3: the establishment of a sales subsidiary in a foreign market; and
- Step 4: the establishment of a production/ manufacturing facility in a foreign market.

The Uppsala Model was the first to introduce the concept of psychic distance, which is defined as the distance between the company's home

market and other markets that have the same social, political, and economic characteristics (Hermannsdottir, 2008). This distance is influenced by factors that could disrupt the flow of information between subsidiaries. These factors include language, culture, political system, quality of education, level of industrial development and, to some extent, locational distance (Johanson & Wiedersheim-Paul, 1975).

Johanson and Vahlne (1977) developed a Dynamic Learning Sequence Model that focuses on an individual firm's gradual acquisition, integration and use of knowledge to increase its commitment to foreign markets incrementally. The distinction between the state and the change aspects provided the model's main structure, as shown in Figure 2-1. The state aspect variables are resource commitment and market knowledge. While the change aspect variables are commitment decisions and current activities. The gradual acquisition of market knowledge through resource commitment reduces the perceived risk of operating in that market, which influences the foreign market's activities and the commitment decision regarding that market (Johanson & Vahlne, 1977).

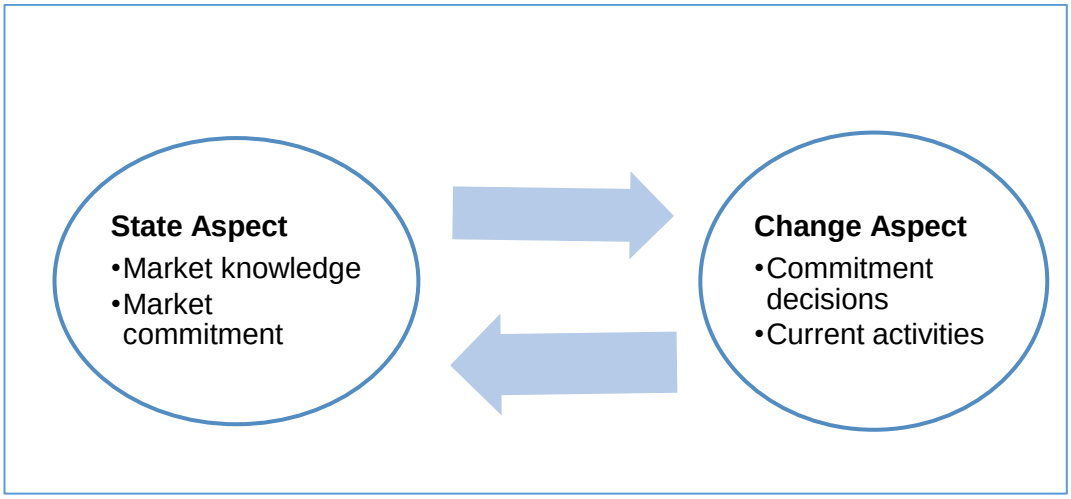



***Figure 2-1: Johanson and Vahlne's Dynamic Learning Sequence Model (Johanson & Vahlne, 1977, p. 26)***

The other behavioural approach models are related to innovation. The models were formulated from the original Johanson and Vahlne model, and innovation replaced the state aspect (Anderson, 2000; Hermannsdottir, 2008). They include those developed by Bilkey and Tesar, Cavusgil, Reid and Czinkota. These models identified six stages in the internationalisation process, which are influenced by the attitude, expectations, and experience of the decision-maker (Anderson, 2000; Hermannsdottir, 2008). These stages are summarised as follows (Anderson, 2000):

- Stage 1: focused on domestic markets.
- Stage 2: pre-export stage (market seeking).
- Stage 3: experimental stage.
- Stage 4: export relationship with a 'psychologically close' country.
- Stage 5: experienced exporter.
- Stage 6: expansion into other 'psychologically close' countries.

### 2.3.2 Network Theory

The Network Theory expanded on the behavioural approach. The theory claimed that firms use their relationship networks to establish and develop market positions in foreign countries (Mtigwe, 2006). These networks are complex exchange relationships that are used to serve different functions, such as reducing transactional costs, the development of knowledge and competencies, or as a bridge to third party contributions such as a government assistance program (Glückler, 2006; Mtigwe, 2006). There are various Network Theory models, including those developed by: Johanson and Mattson in 1987; Carson *et al*. in 2004; and Johanson and Pao in 2012.

Johanson and Mattsson (1987) developed a network model based on the interface between relationships and interactions. The relationship components include mutual orientation, investment, bonds, and dependence. Mutual orientation includes the preparedness to interact, mutual knowledge and respect for each other's interests. The interaction components are exchange and adaptation processes. The exchange processes include social, business and information exchange. The adaptation processes include products, production, and routines (Johanson & Mattsson, 1987).

Carson *et al*. (2004) proposed a three-way interaction network model between the structural components, relational components, and usage/ decision-making components. The structural components are network size, formality, density, stability, and flexibility. The relational components are trust, commitment, and cooperation. The usage components are management product decisions, pricing, distribution, and market knowledge. The decision-making components are the interactions between the structural and relational components (Carson, et al., 2004).

Johanson and Pao (2012) developed a network model based on types of networks and their relationships. The types of networks include integrated networks, foreign networks, and home networks. The relationships are business, social and institutional relationships. Business relationships are supplier and customer relationships; social relationships are personally acquired to gain market knowledge and identify opportunities; institutional relationships include third party relationships with non-commercial agencies. The institutional relationships can be divided into two groups: the profit-driven group that consists of banks, consultancies, and law firms; and another group that consists of authorities, trading agencies and unions (Johanson & Pao, 2012).

### 2.3.3 Shortcomings of the Behavioural Approach

The behavioural approach has been criticised for being overly deterministic (Seifert & Machado-da-Silva, 2007). Anderson (2000) criticised the Johanson and Vahlne model for being vague, non-directional and untestable for falsifiability. The approach does not account for companies that make a strategic choice to internationalise, without going through the behavioural/ process steps; and born global companies (Seifert & Machado-da-Silva, 2007; Mtigwe, 2006).

## 2.4 Motives for Internationalisation

The motives for internationalisation can either be aggressive or defensive. Aggressive internationalisation is when a company invests abroad to advance its strategic objectives. Defensive internationalisation is when a company invests abroad to protect its market position from its competitors or new foreign markets (Dunning & Lundan, 2008). These motives can be market seeking, natural resource seeking, efficiency-seeking and strategic asset seeking.

### 2.4.1 Market Seeking

The market seeking internationalisation motives are mostly horizontal and relate to expansion or replacement matters (Hong, et al., 2019). Expansionary market seeking investment occurs when a company opens a parallel subsidiary in foreign markets to complement the domestic operation. Expansionary market seeking could be due to export-limiting tariffs or other cost-raising barriers or because the size of the foreign market justifies local production (Dunning & Lundan, 2008). This type of market seeking results in an increase in domestic employment, and expansion of a firm's scale and scope (Hong, et al., 2019). Replacement market seeking investment occurs when a domestic market declines and forces a domestic company to look for other international markets to counter the domestic decline. With this market seeking motive, direct investment is a strategic substitute for declining domestic demand and employment (Hong, et al., 2019).

Dunning and Lundan (2008) identified four reasons why firms might engage in market seeking internationalisation: "because their customer has set up foreign facilities and the firm has to cross the border to retain the business; to adapt to local needs; production and transaction cost are less than exporting from a distance; and fourth, the firm might consider having a physical presence in the leading markets as part of its global long term production and marketing strategies" (Dunning & Lundan, 2008, p. 71).

### 2.4.2 Resource Seeking

Resource seeking internationalisation occurs when companies invest abroad, to acquire specific resources of high quality at a lower cost than they would pay in their home country (Dunning & Lundan, 2008; Alcântara et al., 2016). This type of internationalisation uses a vertical structure. A company sets up an upstream subsidiary in a foreign country to extract and export raw material to its downstream subsidiary in its home country (Hong,

et al., 2019). Dunning and Lundan (2008) identified three motives for resource seeking internationalisation: seeking physical resources; seeking a plentiful supply of cheap and well-motivated unskilled and semi-skilled labour; and aiming to acquire the technological capability, management skills or marketing expertise and organisational skills of the host country.

Physical resource seeking internationalisation is driven by cost minimisation, availability, and a reliable supply of raw materials (Dunning & Lundan, 2008). Usually, the physical resource seekers target resource-abundant countries that lack the capital required to extract the resources (United Nations Conference on Trade and Development, 1998). This internationalisation approach tends to crowd out non-resource seeking direct investment, which results in Dutch disease (Ksenia & Phillip, 2013). Dutch disease occurs when the natural resource export boom in a country results in a chronic over-evaluation of its exchange rate, which then leads to a contraction of other tradable activities (Kojo, 2015). The recent rise in internationalisation by state-owned transnational corporations from resource-rich countries (especially from South America) has created barriers to market entry for other multinational corporations, and opportunities for joint ventures and non-equity arrangements (United Nations Conference on Trade and Development, 1998).

The other type of resource seeking internationalisation motives is seeking cheap, well-motivated and semi-skilled labour. This motive is often seen with labour-intensive manufacturing and services multinational corporations from developed countries, which set up a subsidiary in a developing country that offers cheap labour, to cut production costs (Sahiti, et al., 2018). Another resource seeking internationalisation motive is attracting innovation capabilities and technical skills. Examples of this type of collaborative alliance include the United Kingdom chemical companies and the French pharmaceutical companies' alliance, and the Australian iron ore mining companies and the Japanese steel industry (Dunning & Lundan, 2008).

### 2.4.3 Efficiency Seeking

The efficiency-seeking internationalisation objective is to optimise the exploitation of the acquired foreign assets, while the market and resource seeking internationalisation objectives are to acquire resources and assets. Dunning and Lundan (2008) pointed out that the motive for efficiency-seeking is to rationalise and optimise the company's cross-border structure and to gain from having geographically dispersed activities. The objective is to reduce the overall cost of production, increase economies of scale and scope, and reduce the risk of operating in a single country by diversifying into foreign markets (Cui, et al., 2014).

Dunning and Lundan (2008) identified two main types of efficiency-seeking internationalisation: those designed to take advantage of differences in the availability and relative cost of traditional factor endowments between countries; and those designed to take advantage of the psychic distance. Multinational corporations concentrate production in a limited number of locations but supply multiple markets. This allows them to take advantage of different factor endowments, cultures, institutional arrangements, demand patterns, economic policies, and market structures (Dunning & Lundan, 2008).

### 2.4.4 Strategic Asset Seeking

The strategic internationalisation motives usually emerge in some type of merger and acquisition or joint venture. The aim is to enhance the core competencies and competitive advantage of the firm by enabling radical improvement of its current knowledge base (Cui, et al., 2014). Dunning and Lundan (2008) noted that the strategic asset seeking motive is less aimed at exploiting advantages and more aimed at acquiring physical assets and human competencies. The goal is to create a new firm-specific advantage by complementing home-based knowledge with the new host-based

knowledge by learning or gaining access to the necessary assets (Elia & Santangelo, 2012; Hong *et al*., 2019).

Dunning and Lundan (2008, p. 73) identified six strategic internationalisation motives: “to acquire and engage in a collaborative alliance to block competitors from doing so; to merge with foreign rivals and strengthen their joint capabilities; to corner the market for a particular raw material by acquiring the supply; to diversify its product range by buying out firms producing the range of goods and services; to gain access to distribution outlets to promote its brand of products; to merge with local firms to secure host government contracts”. Strategic seeking internationalisation involves aggressive long-term positioning action to strengthen the ownership-specific advantage (Cui, et al., 2014).

## 2.5 Determinants of Internationalisation

The determinants of internationalisation can be classified into policy and non-policy determinants, depending on the type of investment, i.e., horizontal (market and resource seeking) or vertical (efficiency-seeking) (Fedderke & Romm, 2006). Policy determinants include trade openness, product-market regulation, labour market arrangements, corporate tax rate and infrastructure. Non-policy factors include market size, distance, factor proportionality, and political and economic stability (Fedderke & Romm, 2006).

The United Nations Conference on Trade and Development (1998) identified three classes of host country determinants, as indicated in Figure 2-2. It includes a policy framework for FDI, economic determinants and business facilitation.

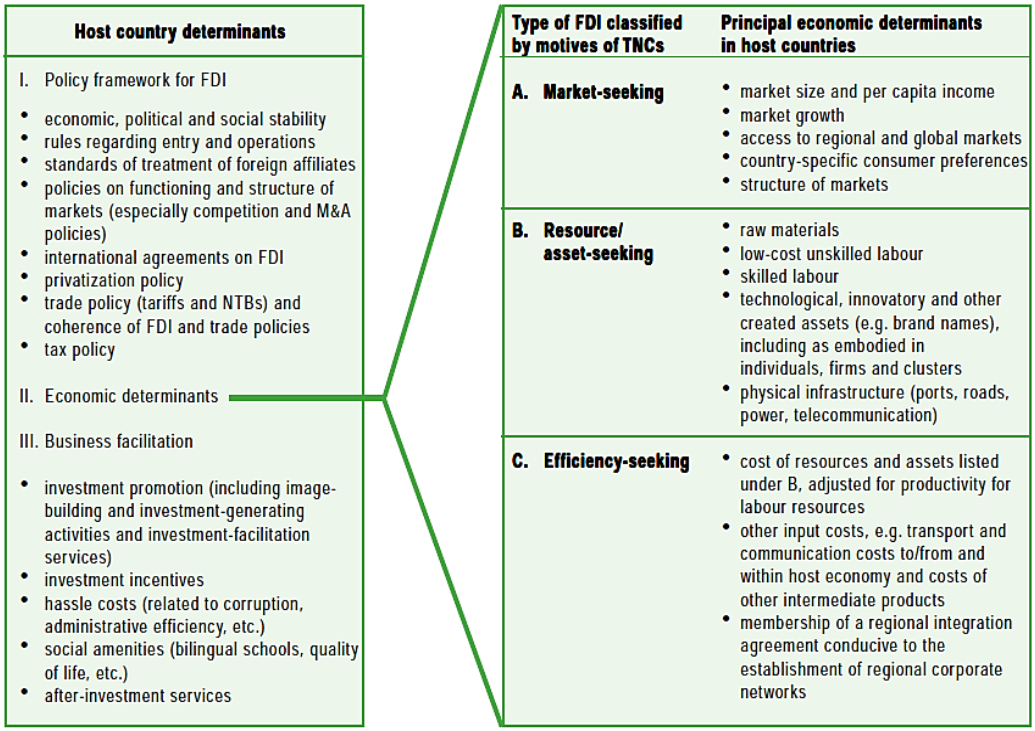



***Figure 2-2: Determinants of internationalisation (Source: United Nations Conference on Trade and Development, 1998, p. 91)***

Market size is the key determinant in attracting market seeking direct investment (Fedderke & Romm, 2006; Akin, 2009; Vijayakumar *et al*., 2010). Large markets attract a high investment inflow because they provide opportunities to benefit from economies of scale and reduced production costs (Akin, 2009; Sahiti *et al*., 2018). Fedderke and Romm (2006) pointed out that market size is a key consideration at the firm level because the return on investment depends on the economies of scale. Ksenia and Phillip (2013) argued that market size determines the tendency of specialised firms to locate complementary assets and establish a base. However, market size does not affect resource seeking direct investment, as this type of internationalisation depends on policy factors such as labour-market arrangements, infrastructure, and trade and tax regulations (Ksenia & Phillip, 2013).

Friendlier government policies and economic stability are considered to be two of the most important determining factors for attracting direct investment (United Nations Conference on Trade and Development, 1998; Dunning, 2001). A friendlier domestic institutional framework and macro-economic environment are more likely to affect an investment decision than market size (Sahiti *et al*., 2018). A stable economic environment (measured by per capita income, GDP and GNP growth rate, industrial production index, interest rates and inflation rate) are also likely to influence inflows of direct investment (Vijayakumar, *et al*., 2010). Sahiti *et al*. (2018) stated that the nature of infrastructure in the host country could impact productivity and efficiency, especially for export-based firms. Therefore, governments that invest in infrastructure are more likely to attract the required type of direct investment.

## 2.6 Effect of Outward Direct Investment on the Economy of the Home Country

The early research on the effect of outward FDI on the home country focused mostly on developed countries, especially Sweden and the USA. The main reason was that the bulk of FDI before 1990 came from developed countries; therefore, it was in their interest to study the effect of outward FDI on their country (Herzer, 2011). These studies include the studies done by Lipsey and Weiss (1984) and Blomström, *et al*. (1987).

Lipsey and Weiss (1984) used a Gravity Model of International Trade (GMIT), which is based on disaggregated data, to study the effect of foreign production by USA firms on home exports. Blomström *et al*. (1987) also used a GMIT to study the effect of production by Swedish and USA affiliates on their home country's exports. Both studies found a complementary relationship measured in net sales or net local sales for Sweden. For the USA, Blomström *et al*. (1987) found mixed results, but a predominantly complementary effect, with few negative coefficients, which implied a

substitutional effect in some cases. Lipsey and Weiss (1984) found that higher output from the USA affiliates in a specific country increased export from the USA to that country.

Swedenborg (2001) used the Two-Stage Least Square estimation to estimate the effect of foreign production by Swedish companies on Swedish exports. The study found: a weak negative effect on non-Swedish affiliated firms operating both in Sweden and in foreign markets; and a strong positive effect on Swedish affiliated firms, which offset the negative effect. Foreign production gave big firms the ability to invest in research and development, become specialists and broaden their distribution network abroad, which all benefitted the home country - in this case, Sweden. Svensson (1996) argued that most studies found a complementary relationship because they focused on vertical internationalisation, and the complementary effect was due to the increase in exports of intermediate goods from the home country to a foreign affiliate, which produced the final goods. Svensson (1996) found a net negative effect on Swedish parent companies that moved production abroad and, more specifically, a strong substitutional effect in cases where under-developed countries were the host. Swedenborg (2001, p. 122) rejected Svensson's findings, arguing that the results were due to "methodological weakness".

Feldstein (1995) used partial equilibrium and macro-economic general equilibrium methods to explain how outward FDI was likely to displace domestic investment. In terms of partial equilibrium analysis, the firm can finance its foreign affiliates by approaching foreign equity investors or recapitalising its assets. The high start-up cost is likely to displace the capital expenditure of domestic affiliates in the short and medium term, while both domestic and foreign affiliates will have to share the available stay-in business capital. Either way, the capital available for domestic investment will be reduced. In terms of macro-economic general equilibrium analysis, the net impact of outward FDI depends on the extent to which it

affects the aggregate net outflow of capital. The net outflow of FDI is likely to be offset by a reduction in outbound portfolio investment or an increase in inbound portfolio investment. The study found that each USA dollar (US$) of investment in foreign affiliate reduced the domestic capital stock by between US$0.20 and US$0.40 (Feldstein, 1995).

Braunerhjelm and Oxelheim (2000) used the Ordinary Least Square (OLS) and Iterative Seemingly Unrelated Regression (ITSUR) estimation techniques to estimate the effect of regional integration by Swedish companies on the relationship between foreign and home country investment rates. The study found a robust substitutional relationship between investment abroad and at home. The negative effect was amplified when the analysis was confined to the core economic areas in which the Swedish companies operate, including chemicals, fabricated metal products, machinery, and equipment (Braunerhjelm & Oxelheim, 2000).

Pfaffermayr (1996) investigated the relationship between Austrian FDI outflows and home exports using the Pooled Time-Series Cross-section Estimation method. The study found a strong complementary relationship between outflows and the home country's exports, with causation in both directions. Alguacil and Orts (2002) also found a complementary relationship when using a five-variable vector auto-regressive model to determine if Spanish FDI outflows had a substitutional or complementary effect on home exports.

Herzer (2011) studied the effect of outward FDI on the total factor productivity of 33 developing countries, using panel cointegration techniques, and found a complementary relationship over the long run. Gondim *et al*. (2018) used autoregressive distributed lag bound testing (ARDL) to test the effect of outward FDI on Brazil and China's domestic investment. The study found that outward FDI enhanced domestic investment by providing access to new knowledge and technology.

Al-Sadig (2013) provided a different perspective on the effect of outward FDI on developing countries. The study used the flexible accelerator model (FAM) and panel data from 121 developing countries between 1990 and 2010. The findings showed that a single percentage point increase in FDI outflows led to a 29 percent decrease in domestic investment. Every US$10 of outflow of direct investment reduced domestic investment by US$2.9 in the short run and US$7.8 in the long run (Al-Sadig, 2013). Mebratie and Bedi (2013) used the two-period panel data of South African manufacturing companies to examine the impact of foreign ownership on domestic labour productivity. The study did not find any learning and knowledge spillover effect of foreign ownership on domestic productivity.

Silva and Forte (2018) pointed out that the relationship between the home country and outward FDI is complicated and depends on:

- the level of the study (country, industry, firm or product); -
- the home country's level of economic development (traditional, under-developed, developing and developed); -
- the type of data used. Aggregated data delivered a complementary relationship, while disaggregated data delivered a substitutional relationship.

Silva and Forte (2018) also found a substitutional relationship in horizontal production integration and a complementary relationship in vertical production integration. Table 2-3 shows the findings of the different studies.

***Table 2-3: Reported findings on the effect of internationalisation on the home country***

| Author (year) | Country of study | Estimation technique | Effect on home country |
|---|---|---|---|
| Lipsey & Weiss (1984) | USA | GMIT | Positive |
| Blomström, *et al*. (1987) | Sweden & USA | GMIT | Sweden (positive) & USA (mixed) |
| Svensson (1996) | Sweden | Two-Stage Least Square | Negative |
| Feldstein (1995) | USA | Partial and general equilibrium effect | Negative |
| Pfaffermayr (1996) | Austria | Pooled time-series cross-section | Positive |
| Braunerhjelm & Oxelheim (2000) | Sweden | OLS and ITSUR | Negative |
| Swedenborg (2001) | Sweden | Two-Staged Least Square | Positive |
| Alguacil & Orts (2002) | Spain | 5VARM | Positive |
| Herzer (2011) | 33 developing | Panel co-integration | Positive |
| Al-Sadig (2013 | 121 developing | FAM | Negative |
| Membrarie & Bedi (2013) | South Africa | OLS | Negative |
| Gondim, *et al*. (2018) | Brazil and China | ARDL | Positive |
| Silva & Forte (2018) | Portugal | Fixed Effects Model | Inconclusive |

## 2.7 Chapter Summary

The aim of this chapter was to provide an overview of the theories on internationalisation, its motives, and determinants, and how it affects the home country. According to Dunning and Lundan (2008), outward FDI from developing countries emerged in the late 1970s, when successful companies started to use their comparative advantage to exploit intra-regional markets. This regional expansion advanced to foreign expansion when resource-poor developing countries, like China and India, started to look for raw materials abroad, in order to sustain their growing populations and economic growth. The 2003 commodity boom also prompted resource companies in some developing countries to start looking for resource markets abroad to facilitate their expansion (Dunning & Lundan, 2008). By 2010, outward FDI from developing countries accounted for 31 percent of the total world outward FDI, compared to 0.5 percent in the early 1970s (Herzer, 2011).

In theory, internationalisation or outward FDI should have a negative effect on domestic investment in resource-rich developing countries like South Africa, and a positive effect on raw material seeking countries like China and India. Al-Sadig (2013) argued that, under imperfect financial markets, outbound FDI raised the domestic interest rate by making borrowing difficult for local firms. The elevated domestic interest rate is likely to force local firms to migrate their production facilities abroad, which reduced domestic exports. This view was affirmed by Feldstein's (1995) partial equilibrium findings, which indicated that investing abroad distorts the overall parent company's capital budgeting, resulting in reduced domestic investment. In terms of resource seeking developing and developed countries, Svensson (1996) pointed out that the complementary effect was due to vertical export integration between the host country affiliate and the home country parent company. Without vertical integration, the outward FDI would create a domestic investment void back home. The next chapter delves into the

current global trends in mining investment, and the literature on the motives and determinants of internationalisation in the mining sector.

# 3 MOTIVES AND DETERMINANTS OF GLOBAL MINING SECTOR INTERNATIONALISATION

## 3.1 Chapter Overview

The global mining investment markets in countries rich in mineral resources have become competitive. The competition increased when most of these countries implemented privatisation, deregulation, and liberalisation initiatives to attract mining investors (Tole & Koop, 2011). The aim of this chapter is to review the global trend from 2004 to 2019 in mining investment. It also provides the background regarding the motives and determinants of internationalisation in the mining sector.

## 3.2 Overview of Global Mining Investment Trends

Figure 3-1 shows the financial performance of global metals and mining for the period 2007 to 2017. Global mining and metals cash flows recovered steadily from the 2015-2016 Chinese stock market turbulence. The recovery was highlighted by growth in revenue, operating cash flow, capital expenditure, net acquisitions, and dividend payments. Stable demand, low supply growth and stable commodity prices were mostly responsible for the growth (S&P Global Ratings, 2018). Besides the impressive financial performance, only a marginal increase in market capitalisation was recorded between 2004 and 2019 (PriceWaterhouseCoopers, 2019), as investors were not willing to make investment decisions based on historical prices. There was speculation that prices were likely to fall soon, due to the trade war between China and the USA and other factors (S&P Global Ratings, 2018).

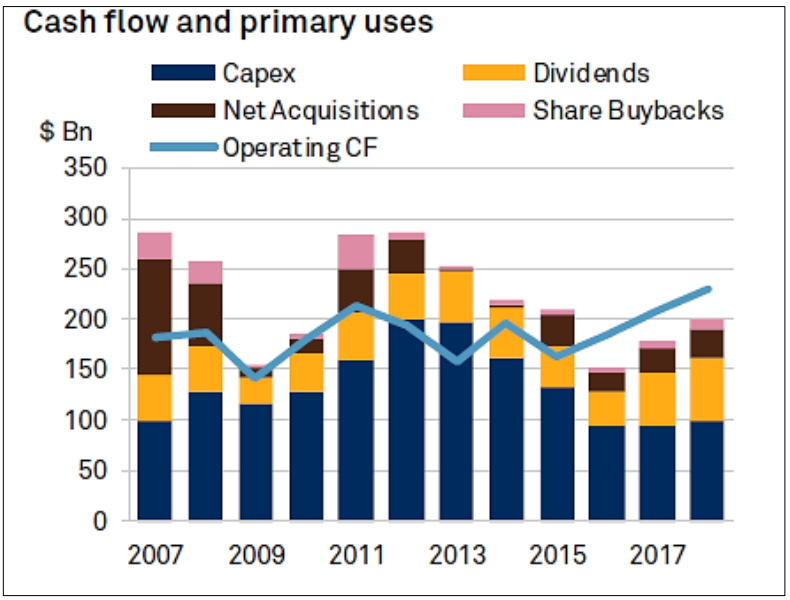



***Figure 3-1: Global metals and mining cash flow and primary uses (S&P Global Ratings, 2018, p. 11)***

The internal political, economic, and socio-economic factors of the host country have a significant influence on the ability of a mining company to develop and delineate Mineral Resources and repatriate profits in the long term. Ernst and Young (2019) indicated that the social license to operate was the number one business risk faced by the mining and metal sector in 2019 (Ernst and Young, 2019). KPMG International (2019) identified community relations and the social licence to operate as the third highest risk faced by mining companies. This is evidence that socio-economic factors have a significant influence on the viability of a mining project. The social licence to operate has evolved past the narrow focus on social and environmental issues, and mining communities and stakeholders are increasingly looking towards mining projects for true shared value (Ernst & Young, 2019). The promotion of sustainable development and good governance structures in the mining sector has ensured that local communities become more involved in the process of extracting Mineral

Reserve and that the benefits are shared equitably between all stakeholders (Mtegha, et al., 2006). Minnitt (2001) detailed the factors that are essential for the mining and mineral sector to contribute to sustainable development, and these factors are:

- Shared knowledge base and understanding of the issues affecting the industry, government, community and other stakeholders;
- Highlighting the value of mining companies, non-government organisations and communities, which is reflected in a company's corporate social responsibility programme. This should indicate the social expectations of mining operations;
- Allocation of responsibility for community development beyond the mine site to voluntary organisations, companies, the community, and government; and
- Developing trust and a new partnership between industry and community, in order to monitor and resolve issues arising from mining operations.

PriceWaterhouseCoopers (2019) identified political and regulatory challenges as two other key drivers of volatility and uncertainty in the mining sector. The Fraser Institute did a survey in 2019 to determine what factors mining companies consider when making an investment decision. The survey found that the host country's sovereignty was a critical factor that determines an investment destination. The sovereignty factors include trade barriers, security level, political stability and availability of labour and skills (Stedman, *et al*., 2019). KPMG International's 2019 annual top 10 list of risks in mining listed permitting risk at number two, political instability at number seven and regulatory changes/ burden at number eight. A sound investment policy is also key to the host country's ability to attract mining investment, as it allows mining companies to predict and optimise the operational profitability of investing in mining the mineral resources of the host country.

## 3.3 Motives for Internationalisation

The motives for investing in a certain mining jurisdiction could be resource seeking, market seeking, efficiency-seeking or strategic seeking. The motives can also vary along the mine value chain (Kraemer & Van Tulder, 2009). During exploration and development, when the aim is to acquire a reliable source of raw materials, physical resource-seeking investments dominate. In the production and refining phase, labour and efficiency-seeking direct investment dominate. Well-motivated labour is required for productivity, while operational efficiency must be maintained to keep the operation profitable. Market and strategic seeking direct investment dominate during the supply and distribution of the final product (Kraemer & Van Tulder, 2009).

### 3.3.1 Resource Seeking

The fundamental motives of mining investment decision-making are resource seeking. This type of investment occurs when companies invest in the host country in order to access and control Mineral Resources (Alcântara, *et al*., 2016). It is mostly driven by at least two factors which are to acquire scarce natural resources for their home country (vertical integration); and to use the location advantage to profitably produce the raw material at low prices (efficiency-seeking) for the market (Ren, 2013).

Mining companies in fast-industrialising countries acquire natural resources through vertical integration to circumvent inadequacies in the international markets (Kraemer & Van Tulder, 2009). These include mining companies from fast-developing nations such as India and China. Vertical integration eliminates the transaction cost associated with raw material suppliers and ensures a reliable, ‘guaranteed’ supply of raw materials (Kraemer & Van Tulder, 2009)).

### 3.3.2 Market Seeking

The main drivers of market seeking mining internationalisation are the internalisation advantages, which are associated with acquiring a Mineral Resource. Spot price purchase and long-term contracts are used when trading the final products of mining. These contracts are negotiated occasionally to reduce transaction costs, which are also based on product specificity, quality, and scarcity, and geopolitical conditions (Kraemer & Van Tulder, 2009).

The mining sector's cash flows may have recovered from the 2015-2016 Chinese stock market turbulence; however, the overall outlook has been unstable from 2007 to 2018 due to geopolitical conditions worldwide. These include the uncertainty regarding, the USA trade and tariff dispute with China, and the trade sanctions against Russia and Iran (PriceWaterhouseCoopers, 2019).

### 3.3.3 Efficiency Seeking

The efficiency-seeking motives are dominant in the production and refining stage of the mining value chain when economies of scale play a significant role in profitability. The motives are to spread the value-adding activities geographically and to exploit the difference in factor efficiency between countries (Ren, 2013). Efficiency seeking mining investment is good for the host country because it exposes the mining sector to broader international markets and investments.

Most mining companies are involved in efficiency-seeking internationalisation, as geographical dispersal makes them less sensitive to economic buoyancies in the host country, such as macro-economic instability, labour scarcity, physical infrastructure limitations, unfavourable land and property laws, and a volatile exchange rate and financial market (Kusek & Silva, 2018).

### 3.3.4 Strategic Asset-Seeking

Most multinational mining corporations prefer to function in oligopolistic markets. They erect entry barriers and block small domestic competitors from benefiting in their home market or a foreign location (Kraemer & Van Tulder, 2009). Companies in emerging markets pursue aggressive acquisition strategies in advanced economies to address the technological shortfalls in the home country and transform themselves into global players (Elia & Santangelo, 2012). Ren (2013) also noted that most Chinese mining companies expand globally in search of strategic assets such as superior mining skills, marketing expertise, external markets, exploration, and technology.

## 3.4 Determinants of Internationalisation

Dunning's Eclectic Paradigm advantages are the primary determinants of direct investment in the mining sector. The ownership-specific advantages define the degree of control and management of risk associated with an investment decision (Mutwiwa & Fondo, 2015). In many jurisdictions such as South Africa), Mineral Resources are owned and controlled by the state. While in other countries such as Canada, the private investor owns the mineral resources. Location advantages determine the overall cost of producing from one foreign location compared to another location. Location advantages include political stability, distance from the markets, skilled labour availability, and friendlier regulatory environment, fiscal and investment policies (Kraemer & Van Tulder, 2009). South African mining companies use their home country's internalisation advantages such as the history of political instability, volatile labour markets and institutional voids. as a comparative advantage when investing in African countries that are politically unstable (Luiz & Ruplal, 2013).

Otto (1992) surveyed 39 mining companies to determine what factors were considered when deciding where to invest. Table 3-1 provides a list of the 23 key factors that influence the final mining investment destination. Vivoda (2017) grouped these factors into nine categories: geological, political, investment promotion, operational, financial, regulatory, fiscal, profit, environmental and social. These factors are further discussed in sub chapter 3.4.1, 3.4.2, 3.4.3 and 3.4.4.

***Table 3-1: Key mining investment decision factors (Otto, 1992; Luiz & Ruplal, 2013; and Vivoda, 2017)***

| Vivoda's categorisation | Otto's Ranking Decision criteria | Exploration stage | Mining stage |
|---|---|---|---|
| Geological | Geological potential for target mineral. | 1 | n/a |
| | Established mineral titles system. | 14 | 17 |
| | Ability to apply geological assessment techniques. | 15 | n/a |
| Political | Consistency and constancy of mineral policies. | 4 | 9 |
| | Long-term national stability. | 13 | 16 |
| | Internal (armed) conflicts. | 20 | 20 |
| Investment promotion | Import-export policies. | 17 | 15 |
| Operational | The company has management control. | 5 | 7 |
| | Mineral ownership. | 6 | 11 |
| | The majority equity ownership is held by the company. | 18 | 18 |
| | Right to transfer ownership. | 19 | 21 |
| Financial | Ability to repatriate profits. | 3 | 2 |
| | Realistic foreign exchange regulations. | 7 | 6 |
| | Permitted external accounts. | 21 | 14 |
| | Ability to raise external financing. | 12 | 12 |
| Regulatory | Security of tenure. | 2 | 1 |
| | Stability of exploration/ mining terms. | 8 | 4 |
| | Modern mineral legislation. | 22 | 19 |
| Fiscal | Ability to predetermine tax liability. | 9 | 5 |
| | Method and level of tax levies. | 16 | 13 |
| | Stability of fiscal regime. | 11 | 10 |
| Profit | A measure of profitability. | n/a | 3 |
| Environmental and social | Ability to predetermine environmental obligations. | 10 | 8 |

### 3.4.1 Geological Determinants

The geological determinants that influence mining investment decisions include a country's geological potential, the mineral title system, and the ability to apply geological assessment techniques. The geological potential and known resource endowments of the target country is the most fundamental determinant in the initial investment decision trade-off (Vivoda, 2017).

The host country must develop a credible geological database that provides the investor with a basic understanding of Mineral Resources. The availability of a credible geological database provides opportunities to transparently define the true shared value of the Mineral Resources before prospecting and mining operations can commence. The investor and the country can share the burden of risk associated with further delineations and development of the resource (Otto & Cordes, 2002). Inadequate geological understanding of a country's Mineral Resources increases the exploration risk for a mining company, which results in the Mineral Resources being down-graded and the country missing out on FDI (Vivoda, 2017).

The mineral title management system needs to integrate the geological database with the country's geographic information system. The integration enables a system that links geological information with mining licences, location, fees and other geographic or topographic information (Morgan, 2002). It also provides an opportunity for ranking and competitive auctioning of prospecting blocks, based on their potential and infrastructure accessibility (African Union, 2009). According to Morgan (2002, p. 168), an effective mineral title system must be based on:

- "Modern mining cadastre or survey;
- clear, open, and transparent application procedure;

- duration and continuity of tenure;
- adequacy of rights and access to land;
- company obligations and reporting requirements;
- cancellation and suspension; and
- transferability."

### 3.4.2 Political Determinants

Political factors that influence mining investment decisions include the consistency and constancy of the mineral policies, long-term national stability, and the host country's propensity to internal (armed) conflict. Any perceived instability in the country's governance is considered a political risk and is likely to discourage mining investment. Political risk arises when unilateral government action results in a change in the economic value of a project (Otto & Cordes, 2002).

Kasatuka & Minnitt (2006) divided the risks associated with mining investments into commercial and non-commercial risks. Commercial risks are the cumulative effects of operational, business, and financial risks. Non-commercial risks are associated with corruption, political instability, armed conflict, quality of bureaucracy, political party development and other internal factors (Kasatuka & Minnitt, 2006). Commercial risks can be assessed, mitigated, and controlled; non-commercial risks are not under the control of the mining company and therefore have a profound negative effect on mining FDI. A transparent regulatory environment reduces uncertainty and increases commercial confidence.

Otto & Cordes (2002, p. 7-11) identified five principal policy factors that influence mining investment decisions. These factors are:

- Security of tenure that provides unambiguous access to any economically discovered deposit;

- an overall policy environment that is transparent, predictable, stable, and based on the rule of law, which permits decisions to be made with reasonable confidence;
- policies that permit the realisation of a rate of return on investment that is consistent with the perception of assumed risks and that preserve the incentive for managerial efficiency;
- managerial control of overall operating and sales decisions; and
- the absence of restrictions on debt servicing and the repatriation of profits and dividends.

Legal stability is also one of the political risks. While national laws are designed to protect both the investor and the interests of the host country, they might not serve their purpose in a politically unstable environment. Bilateral investment treaties (BIT) and international arbitration provide suitable legal recourse should political stability collapse during the investment cycle. Therefore, countries that do not have BIT agreements with the investor's home country or which are not members of the International Centre for the Settlement of Investment Dispute (ICSID), are not likely to attract the required mining FDI (Vivoda, 2017).

### 3.4.3 Regulatory Determinants

Regulations are the mandated governance guidelines used by governments to manage resources, deliver goods and services, prevent market failure, and plan the country's economic future (O'Callaghan & Vivoda, 2017). These regulations evolve and are becoming increasingly sophisticated. Some of the regulatory determinants include security of tenure, stability of exploration/ mining terms and modern legislation. Otto & Cordes (2002, p. 3-8) identified the primary purposes of mining regulation as being:

- "To authorise lawful entry upon the ground and grant specific rights to a party for exploration and mining;

- to levy special taxes and impose obligations on parties authorised to undertake mineral activities; and
- to empower specific government agencies or offices to implement and enforce the act."

Modern mining regulations have a dual function, to facilitate and encourage investment in the mining sector; and to set limits on mining activities during the exploration and extraction of natural resources (O'Callaghan & Vivoda, 2017). These new regulations provide a more efficient one-stop-shop application and approval system. The system reduces the cost and time to obtain approval, which encourages mineral exploration investment (Vivoda, 2017). O'Callaghan and Vivoda (2017, p. 42) defined the appraisal criteria used to assess the quality and performance of regulatory regimes as: "clarity of roles and responsibility, autonomy, participation, accountability, transparency, and predictability".

### 3.4.4 Fiscal Determinants

The effect of the fiscal regime on mining investment decision-making is both complex and multi-faceted. The fiscal factors that influence mining project economies are the ability to predetermine tax liability; method and level of tax levies; and stability of the fiscal regime. The objective of capital investment is to create wealth, and therefore the issue of sharing rents is a critical concern for the investor (Cawood & Minnitt, 2001).

An unattractive mining fiscal regime is most likely to drive away investment; however, an attractive regime is usually not enough to attract and sustain investments. An economically effective fiscal regime should be based on five considerations that are neutrality, efficiency, equity, clarity, and stability (Otto & Cordes, 2002). The mining investment decision is also likely to be based on the predictability of the tax regulations, which enables companies to predetermine their tax liability (Vivoda, 2017). Otto & Cordes (2002)

outlined the different fiscal policy preferences of government and mining companies, as indicated in Table 3-2.

***Table 3-2: The different fiscal regimes preferences of mining companies and governments (Otto & Cordes, 2002, p. 7-13)***

| | |
|---|---|
| **Mining Company preference** | Tax burden based on realised profitability. |
| | A system that permits early payback of invested capital in response to risks and debt service requirements. |
| | A regime that recognises the volatility of revenues and which is sensitive to fiscal burdens imposed when profits are low. |
| | A stable, predictable, and transparent system. |
| | A system that distorts cost and the extraction profile or reduces the incentive for managerial efficiency should be avoided. |
| | The tax regimes should encourage exploration risk-taking and investment in economically marginal projects. |
| **Government preference** | A tax system that maximises the present value of tax revenue received from mineral extraction. |
| | Support macro-economic stability by providing predictable and stable tax revenue flows from initial production onwards. |
| | Capture a large share of revenue during periods of high profits, and reasonable rents from low cost, high-grade mines. |
| | A tax regime that can be administered effectively and which will minimise the collection cost and the opportunities for avoidance. |
| | Encourage economic efficiency, continued exploration and the new investment needed to expand the tax base of the economy. |

### 3.4.5 Environmental and Social Determinants

The development and extraction of Mineral Resources result in an array of potential environmental problems (Tienhaara, 2006). Mining companies

must be able to predetermine the environmental obligations before investing in a country's Mineral Resources. Complex and inconsistent environmental regulations make it difficult for mining companies to predetermine their environmental obligations (Vivoda, 2017).

The latest empirical literature opposes most theoretical studies that argue that profit-seeking mining companies are likely to be deterred by high environmental costs (Tole & Koop, 2011). The more recent empirical literature has shown that environmental regulations do not affect the location decisions made by mining companies, especially when other factors are the same, such as technology adoption, strategic interaction, and information asymmetries between countries (Tole & Koop, 2011). The short-term cost saving due to lower environmental standards could also be detrimental to a company's corporate image, should environmental problems arise from its operations (Tole & Koop, 2011). In the globalised world, environmental disasters and liabilities associated with mineral resource development are instantaneously transmitted worldwide, which results in reputational damage and boycotts (Tole & Koop, 2011).

A constructive approach to stakeholder engagement and collaboration is becoming standard practice for mining companies (Vivoda, 2017). Mineral development in developing countries takes place mostly in rural communities, and these communities have significant social issues, including poverty, literacy, housing conditions and a lack of basic services. Companies are obliged to build social infrastructure (such as schools, roads, and hospitals) and become de facto social service providers, as part of the social licence to operate (Vivoda, 2017).

### 3.5 Chapter Summary

The aim of this chapter was to review the investment trends of the global mining sector, and the motives and determinants of internationalisation. The

global mining and metal sector have gone through a turbulent period from 2007 to 2018. The 2008 Global Financial Crises almost brought the sector to a halt. The sector was able to recover in 2012 until again interrupted by the 2015-2016 Chinese stock market turbulence. However, the sector was able to recover again due to the stable demand, low supply growth and stable commodity prices.

The socio-economic factors have a significant influence on the viability of developing and extracting Mineral Reserves. Ernest and Young (2019) and KPMG International (2019) identified the social licence to operate as the major risk faced by mining companies. The host country's internal factors were also the key factors that influenced mining investment decisions in 2019 (Stedman, *et al*., 2019).

The motives for internationalisation in the mining sector can be resource seeking, market seeking, efficiency-seeking or strategic seeking. These motives vary across different jurisdictions across the mine value chain. The determinants of internationalisation can be grouped into nine categories: geological, political, investment promotion, operational, financial, regulatory, fiscal, profit, environmental and social. The next chapter reviews the motives and determinants of internationalisation in the South African context.

# 4 INTERNATIONALISATION IN THE SOUTH AFRICAN CONTEXT

## 4.1 Chapter Overview

The aim of this chapter is to review the motives and determinants of internationalisation from the South African context. The first section provides an overview of the South African policy framework that affects internationalisation. The second section reviews the motives and determinants of FDI inflows. The third section reviews the motives and determinants of internationalisation of South African companies in general. The fourth section examines the internationalisation of South African mining companies.

## 4.2 Overview of the South African Internationalisation Policy Framework

The trade and financial sanctions imposed on South Africa during the mid-1980s, and the subsequent declaration of a moratorium on payments to external creditors effectively isolated South Africa from international capital markets (Arvantis, 2005). These sanctions were added to the already imposed diplomatic, economic, and military sanctions of 1962. In 1993, the sanctions were uplifted, and Foreign Direct Investment became South Africa's main policy lever for economic growth and development after its reintegration into the world economy in 1994 (Gelb & Black, 2004; Arvantis, 2005; Krugell & Matthee, 2008). The introduction of the Reconstruction and Development Program (RDP) and the Growth, Employment and Redistribution (GEAR) policies made attracting FDI a priority policy objective. The aim was to supplement the low domestic investment rate and stimulate economic growth (Gelb & Black, 2004; Fedderke & Romm, 2006; Krugell & Matthee, 2008).

One of the pressing issues that the democratic South African government had to address after the 1994 reintegration was the liberalisation of capital controls. Fiscal deficit and price inflation were lowered, and average tariffs were reduced from 27 percent to 7 percent, with nearly 60 percent of imports considered for zero tariffs. Capital accounts and the financial system were liberated, and the country joined the World Trade Organisation (Gelb & Black, 2004).

The key debate in the analysis of direct investment flows into South Africa is adopting an exchange control policy to attract FDI. The South African government's rationale for the relaxation of exchange controls might have been that it would lead to trade openness, improved sovereign credit ratings and improved capital movements (Kiss, 2017). However, the timing might have been the issue. The country was still politically and economically unstable, had a high percentage of unskilled workers in the labour market, and a small market size compared to other emerging countries (Schoeman, *et al*., 2010). The relaxation of exchange controls without controlling capital outflows prematurely exposed the small, saturated South African markets to stable fast-growing global markets, which resulted in the accelerated internationalisation of South African companies and divestment from the domestic market. Fedderke and Romm (2006) argued that capital control relaxation is designed to attract portfolio investment and does not address direct capital inflows. The relaxation resulted in a surge of outflow of direct investment out of South Africa, and the easing led to capital flight, de-industrialisation, employment reduction and declining exports (Fedderke & Romm, 2006; Nishiura, 2013).

### 4.3 Motives and Determinants of Direct Investment Inflows

The discovery of diamonds and gold in the 1860s shifted the South African economy from an agricultural economy to an extractive economy. The exploitation of the Mineral Resources required large capital outlays, which

the country could only access through direct and portfolio investment inflows (Gelb & Black, 2004). This resulted in an upswing in economic growth from mining profits, which stimulated the development of the manufacturing sector. The development of the manufacturing sector was further accelerated by the depreciation in the exchange rate caused by the collapse of the gold standard in 1933, and the disruption in the supply and demand markets during World War II (Gelb & Black, 2004). The FDI inflows were later disrupted by the 1962 economic sanctions against the country, which led to a deterioration of the country's economic conditions. The further imposition of trade and financial sanctions in 1980, the tightening of capital controls and the declaration of the moratorium on payments to external creditors effectively cut the country off from international markets (Arvantis, 2005).

Figure 4-1 shows the FDI inflow into South Africa as a percentage of GDP between 1970 and 2019. The cumulative FDI inflow increased between 1994 and 2001 by approximately 1.5 percent of the GDP (Arvantis, 2005).

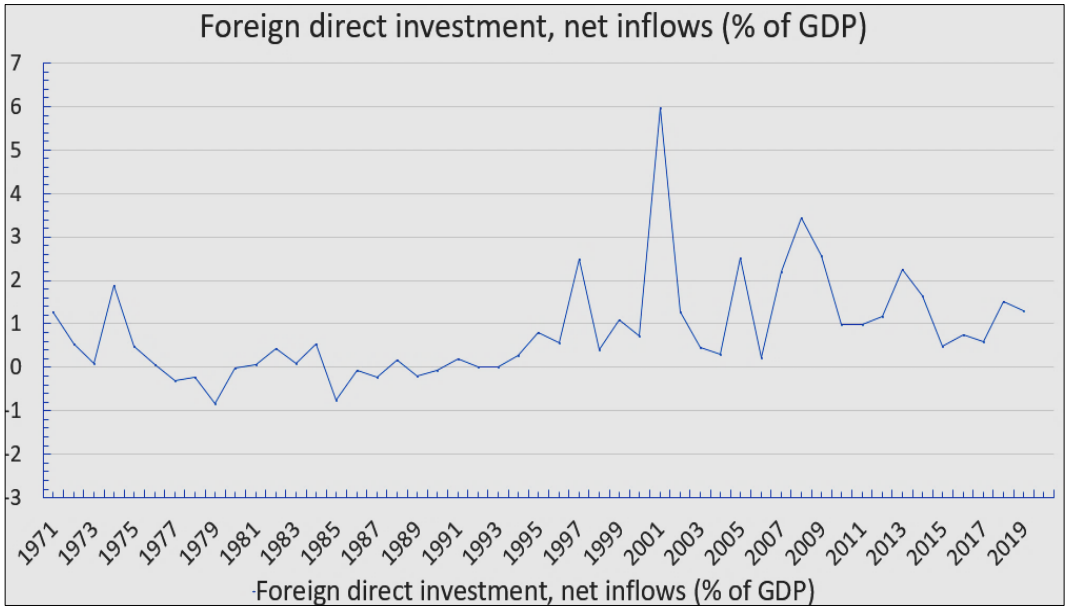



***Figure 4-1: FDI inflows into South Africa between 1970 and 2019 as a percentage of GDP (Worldbank.org, 2020)***

The first major spike in the increase in FDI inflows was recorded in 1997 when Telkom was dismantled and 30% of its equity was sold to the public. This dismantling occurred immediately after the relaxation of the exchange control regulation. The second spike occurred in 2001 when De Beers was de-listed from the JSE and acquired by Anglo American Corporation. The De Beers deal is still accountable for the highest inflows of FDI into South Africa to date. The other significant FDI inflow activity occurred between 2007 and 2008, which was attributed to the commodity boom (Sunde, 2017). The activities included Anglo American Corporation's complete sale of the Highveld Steel and Vanadium Corporation to Evraz in 2007 (Mohamed, 2020) and the partial sale of its 16 percent stake in AngloGold Ashanti in 2008. In 2014, the ratio of FDI inflow to GDP was 2.2 percent, which reflected a recovery from the 0.9 percent slump of 2009. It fell again to 0.5 percent in 2015 but recovered slightly to 1.3 percent in 2019. During the period between 2014 and 2019, the South African economy was also subjected to external and internal factors. The external factors include the slowdown in commodity demand due to the China-USA trade war and the

2015-2016 Chine Stock Market Turbulence. The internal factors included the power outages and the 2014 mining charter update.

The motives behind FDI inflow into South Africa are mostly market and strategic seeking (Gelb & Black, 2004). Most multinational corporations invest in the country through joint ventures, mergers, and acquisitions. They tend to limit their exposure by increasing the ability to reverse their investment at any time during the investment period (Gelb & Black, 2004). Most FDI has little impact on domestic employment, and multinationals tend to focus on sectors with little risk and a quick return on investment (Gelb & Black, 2004). Greenfield investments are relatively scarce in South Africa (Gelb & Black, 2004; Arvantis, 2005). This meant that South Africa attracted investors that are averse to risk because greenfield investments are riskier than brownfield investments. Fedderke and Romm (2006) found that direct investment inflow into South Africa was both horizontal and capital intensive. In horizontal capital intensive foreign direct investment, the motive for investment is mainly market seeking and the market size is the main determinant. Fedderke and Room (2006) a study also found beside market size, other factors such as corporate taxation, wage costs, openness to the economy and increased imports had an impact on FDI inflows.

The literature reported varying determinants of FDI inflow into South Africa due to the nature of the research study and the type of sector in question. A panel data comparison study was done by Arvantis (2005), which compared South African FDI with that of other 16 countries with a sovereign credit rating between BB and BBB+. The study identified infrastructure development, trade liberalisation, skill availability and market size as the essential determinants of direct investment inflow into South Africa. Fedderke and Romm (2006) used the vector error correction model (VECM) to estimate the growth impact and determinants of FDI. The study identified market size, corporate tax, wage cost, trade openness, import to export ratio, political institution structure, property rights and political stability as

important determinants. Dondashe and Phiri (2018) used auto-regressive distributed lag (ADRL) to examine the macro-economic determinants of FDI in South Africa from 1994 to 2016. The study identified per capita GDP, inflation rate, government size, real interest rate and terms of trade as the main determinants. Crime was identified as the leading deterrent of FDI, followed by the cost of capital, labour regulations and skills shortages (Arvantis, 2005). The South African government adopted a policy direction post the 1994 reintegration that made FDI some of the policy levers for economic growth and development. It is important that government, business sector and academic harmonisation these determinants to assist policymakers to develop policies that are guided by these determinants.

## 4.4 Motives and Determinants of Internationalisation by South African Companies

The motives and determinants of the internationalisation of South African companies have become a feature in economic publications and a research theme for several research institutions (Nishiura, 2009). South Africa became a serial outbound foreign direct investor after the liberalisation of exchange controls, with most of the outbound investment destined for the African continent. The continental integration was also eased by the country's participation in initiatives such as the Tripartite Free Trade Area and the Continental Free Trade Area, and bilateral agreements such as the African Growth and Opportunity Act, the European Union (EU)/SADC Economic Partnership Agreement, the EU-SACU (South Africa, Botswana, Lesotho, Namibia, Swaziland) Economic Partnership Agreement and the EU-South Africa Partners for Growth initiative (Bronkhorst & Nieuwenhuizen, 2019).

The ratio of outward FDI flows to GDP is shown in Figure 4-2. The relocation of headquarters to London by South African companies between 1997 and 2001 resulted in a decline in outward FDI contribution, and the contribution

of internationalised South African companies changed from domestic investment to FDI (Nishiura, 2013). As a result, the FDI inflows spiked during this period, as shown in Figure 4-2.

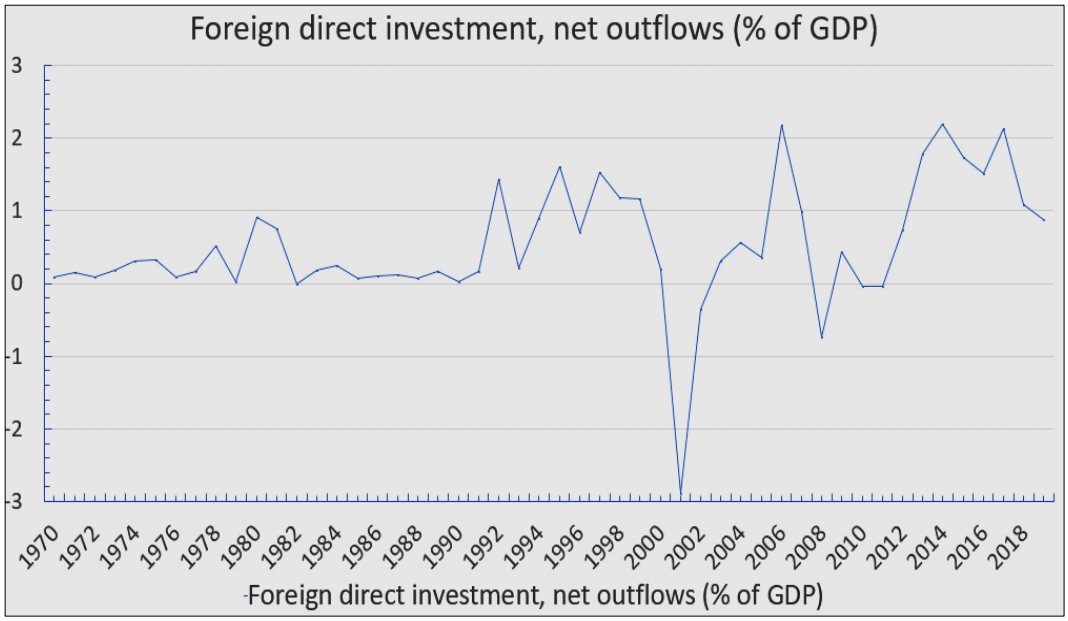



***Figure 4-2: South African outward FDI stocks as a percentage of GDP between 1970 and 2019 (Worldbank.org, 2020)***

The target for South African outward FDI flows in 202 and 2008 were Europe, Americas, Africa, Asia, and Oceania. Figure 4-3 shows the percentage of OFDI per region in 2002 and 2008. Europe attracted most of the OFDI from South Africa. It attracted 75.1 percent in 2002 and 54.8 percent in 2008. The United Kingdom accounted for 24.8 percent of the total outward FDI unto Europe in 2008. The outward FDI into Africa tripled from 7.0 percent to 21.7 percent in 2008. The only region that declined was the Americas from 12.2 percent in 2002 to 7.4 percent in 2008. The diversified nature of the FDI outflows indicate that most of these investments are market seeking in nature. This fact will be elaborated further in this subchapter. In 2017, South Africa was among the top 10 emerging market investors (Kiss, 2017).

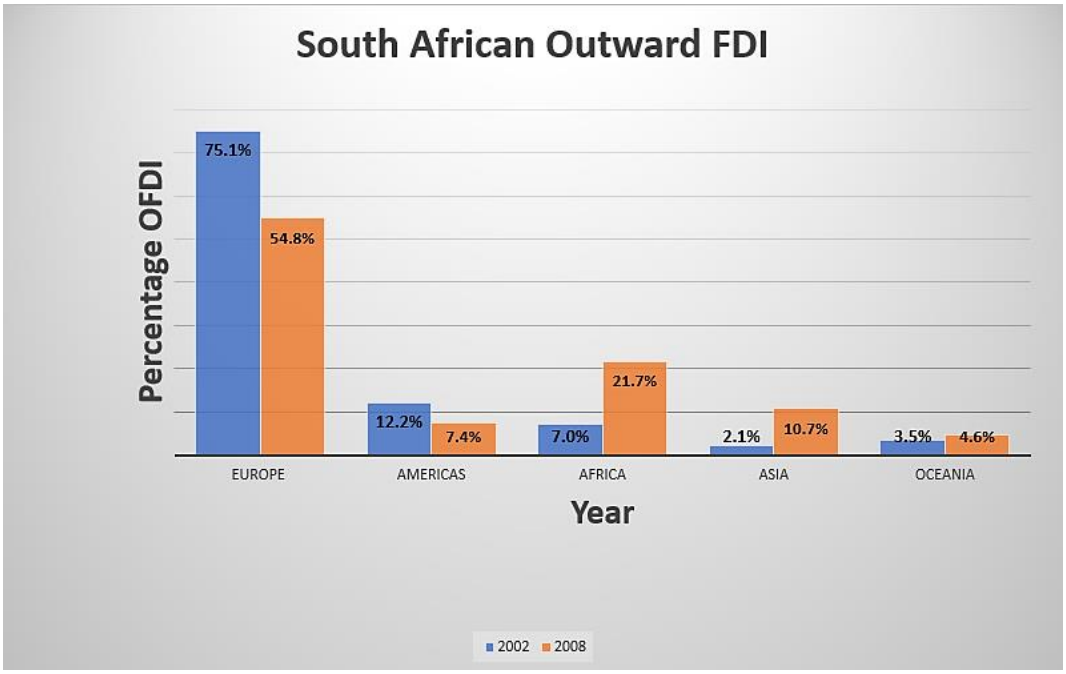



***Figure 4-3: The destination for South African outward FDI in 2002 and 2008 (Nishiura, 2009 and Verhoef, 2011)***

The motives and drivers of the internationalisation of South African companies vary significantly according to the nature of the industry and the individual company's set of priorities (Dippenaar, 2009). The limited local competitiveness and widespread anti-competitive behaviour remain the push factors for most companies to expand into regional and global markets (Bronkhorst & Nieuwenhuizen, 2019). Sibindi (2019) concluded that resources, innovation, size of a firm and network links are key determinants of South Africa's location choice for outward FDI.

The regional expansion strategy adopted by South African retail companies came with challenges, the main one being that 90 percent of the retail market in Africa is occupied by informal trade. Most African countries have limited financial infrastructure, old decaying physical infrastructure and regional trade barriers (White & Van Dongen, 2017). South African retail companies were willing to invest in the infrastructure of those countries and to formalise their retail markets This strategy in turn minimise their risks.

This resulted in the oligopolistic market, with a few South African retail chains holding most of the remaining market share, which creates market barriers for newcomers and unequal bargaining power for suppliers (Das Nair, 2019).

The main reason for most South African telecommunication companies expanding into African markets is to offset the saturation of the South African market and to diversify their risk (Luiz & Stephan, 2011). These companies have played a significant role in shifting most African countries from fixed-line to mobile telephony (Games, 2004). Luiz and Stephan (2011) identified 14 factors that influence the decisions made by South African telecommunication companies to enter specific markets. They include market size, political stability, macro-economic stability, government policy, regulatory environment, infrastructure and logistics, the openness of the economy, competition, country governance, project financing, currency issues, high investment and operating cost, labour considerations and cultural considerations.

According to Sibindi (2019), the motives for internationalisation by South African companies vary from resource seeking to market seeking and efficiency-seeking. Their modes of entry of the South African companies are mostly subsidiaries, joint ventures, and franchising. The motives and internationalisation strategy are summarised in Table 4-1.

***Table 4-1: Motives and internationalisation strategy of South African retail, manufacturing, mining, banking, and technology companies (Source: Sibindi, 2019).***

| Sector | Motives | Internationalisation strategy |
|---|---|---|
| Retail | Market seeking | Joint ventures, subsidiaries, and franchising |
| Manufacturing | Efficiency seeking | Joint ventures and subsidiaries |
| Banking and technology | Efficiency seeking | Subsidiaries, associates, and joint ventures |
| Mining | Resource Seeking | Greenfield, joint ventures and subsidiaries |

## 4.5 Internationalisation of South African Mining Companies

There has been limited research on the effect of internationalisation by South African mining companies on the competitiveness of the domestic sector. Most of the literature has focused on the company's perspective. As Verhoef (2011) elaborated, internationalisation gave companies access to the:

- Global value chain;
- International market;
- Natural resources and technology;
- Diversification option; and
- Option to move away from smaller, saturated domestic markets.

International expansion offered these companies an opportunity to move their assets to locations with more secure hard currency, which increased their asset value – and consequently, their share price (Carmody, 2002). Mining companies that restructured their

conglomerate structure and adopted an aggressive internationalisation strategy include Billiton, Anglo American Corporation, Gold Fields Limited, and AngloGold Ashanti. According to Walters & Prinsloo (2002); Macmillan (2017) and South 32 Limited (2019), Billiton expanded globally in the manner listed below:

- The General Mining and Union Corporation (Gencor) was formed in 1985 from a merger between General Mining and Finance Company and Union Corporation.
- Gencor acquired Billiton from Shell in 1994 and set up an offshore company (Billiton International) in 1997, with a primary listing on the London Stock Exchange.
- Billiton became the first South African company to obtain a primary listing on the London Stock Exchange and a secondary listing on the JSE.
- Billiton restructured its stake in Samancor, Alusaf, Ingwe and Richards Bay Minerals in 1997, after the London Stock Exchange listing.
- In 1998, it separated its South African gold and platinum assets to form Gold Fields Limited and Impala Platinum.
- In 2001, Billiton merged with BHP to form a diversified miner (BHP Billiton), with a primary listing on the London Stock Exchange and Australian Securities Exchange, and a secondary listing on the JSE.
- In 2014, BHP Billiton created an independent diversified mining company, South 32, and transferred all its South African assets into South 32.
- In 2019, South 32 announced its plan to sell 91.8 percent of its shareholding in South's South African Energy Coal (SAEC). This move will reduce South 32's South African exposure to aluminium and manganese.

- Today, BHP Billiton is the world's second largest mining company, with a market capitalisation of over US$44 billion.

According to Walters & Prinsloo (2002), Robinson (2016) and Anglo American plc (2016), Anglo American Corporation expanded globally in the manner listed below:

- Anglo American Corporation (Anglo) was established in 1917 by Ernest Oppenheimer. In 1926, it became the largest single shareholder in De Beers Consolidated Mines, and two years later, it partnered with Hans Merensky to form Anglo American Platinum.
- Anglo ventured into gold mining in 1944 when it established Vaal Reefs Exploration and Mining Company. By 1980, it had 11 gold mine shafts across South Africa, making it the world's biggest gold mining company.
- The first recorded regional expansion of Anglo outside South Africa was in the 1920s, when it started exploration activities in Zambia, which led to the discovery of the Zambian Copperbelt.
- In 1975, it acquired a 49 percent stake in Brazil's Morro Velho gold mine. This investment gave birth to Anglo American South America, which became the largest mining company in South America by 1990.
- In October 1998, Anglo American and Minorca agreed in principle to form Anglo American plc, based in the United Kingdom, with a primary listing on the London Stock Exchange and a secondary listing on the JSE.
- In 2001, De Beers de-listed from all stock exchanges and became a private company, with Anglo holding a 45 percent stake in the company.

- In 2007, De Beers started disposing of its South African assets and by 2010 it had reduced its South African assets from seven to three. By 2015, it had two.
- In 2016, Anglo confirmed the completion of the sale of its Rustenburg operations, including four operating mines, two concentrating plants, a recovery plant, and a tailings treatment plant.
- In 2018, Anglo announced its strategy to sell all its Eskom-tied coal operations and retain four export coal-producing operations. The Eskom-tied operations included three operating and four closed collieries.
- Gold Fields Limited (after Gold Fields, 2012):

According to Gold Fields (2012), Gold Fields Limited expanded globally in the manner listed below:

- Gold Fields of South Africa Limited was founded by Cecil John Rhodes and Charles Durrell Rudd in 1887. It opened the Robinson Deep, Sub Nigel and Simmer & Jack mines between 1894 and 1896.
- In 1931, during the great depression, Gold Fields engineer detected magnetic shale underlying the gold-bearing conglomerates of the Witwatersrand Supergroup. This discovery led to the development of the Wits West line.
- In 1998, Gencor's gold division and Gold Fields of South Africa combined to form Gold Fields Limited. A year later, it acquired Driefontein and so became the world's second-largest gold producer.
- In 2002, Gold Fields Limited was listed on the New York Stock Exchange, while maintaining a primary listing on the JSE.
- In 2018, Gold Fields had three mining operations in Ghana, three in Australia, one in Peru, one in Chile and one in South Africa. It then

announced its plan to start restructuring its remaining South African asset, South Deep.

According to AngloGold Ashanti (2017, 2019), AngloGold Ashanti expanded globally in the manner listed below:

- Anglo American Corporation consolidated its gold assets in 1998 as part of its Minorco merger and the formation of the United Kingdom-based Anglo American pls to form Anglo Gold Limited.
- The newly formed Anglo Gold Limited was listed on the JSE (primary listing) and the New York Stock Exchange (secondary listing) in 1998. It had ten operations in South Africa during that period.
- In 2004, AngloGold Limited and Ashanti Goldfields Company Limited combined to form AngloGold Ashanti.
- In 2006, Anglo American Corporation reduced its stake in AngloGold Ashanti to 16.6 percent and later sold it completely (by 2009).
- In 2018, AngloGold Ashanti had six operations in South America, including three in Colombia, two in Brazil and one in Argentina. It had seven operations in Africa, including two in Mali, two in Ghana, one in the Democratic Republic of Congo, one in Tanzania, one in Guinea and one in South Africa. It had two operations in Australia.

In May 2019, AngloGold Ashanti announced the start of the process to review divestment options for its remaining South African asset, Mponeng

## 4.6 Chapter Summary

The aim of this chapter was to review the motives and determinants of internationalisation from the South African perspective. South Africa relaxed its capital control policies in 1997 following the 1994 political and trade liberalisation, to attract FDI to boost its ailing economy. The country started

to report horizontal, capital intensive FDI inflows, but these inflows have since dissipated, due to internal political, social, and economic deterrents, such as crime, cost of capital, labour regulations and a skills shortage.

The friendlier exchange controls have also turned South Africa into a serial outbound foreign direct investor, with almost every sector in the economy being involved in outward FDI. The cross-border expansion by the retail sector was mostly motivated by market seeking reasons. The manufacturing, banking and technology sectors were motivated by efficiency-seeking reasons. The mining sector was motivated by resource seeking reasons. Mining companies used the newly relaxed capital controls to gain access to global markets and move their assets to more secure hard currencies. The next chapter describes the methodology used in the study to evaluate the effect of internationalisation on the South African mining sector's ability to compete globally.

# 5 METHODOLOGY

## 5.1 Chapter Overview

The aim of this chapter is to describe the methodology used to evaluate the effect of internationalisation on the mining sector's ability to compete globally. It outlines the sources of the data used, and describes the variables used in the research analysis and the analysis techniques employed.

## 5.2 Data Source

The study used annual economic time series data from 2009 to 2018 to analyse how the internationalisation strategy adopted by most South African mining companies has affected the mining sector's ability to compete globally. The period was selected because it came after the time when the South African economy was seeing catch-up growth associated with its integration into the world economy and the erratic cycles of capital flow movement associated with trade liberalisation. This is also the period that shows the state of the South African mining sector post the commodity price super-cycle that occurred between 2002 and 2007, and its subsequent collapse in 2008.

The study used secondary time series data sourced from the annual integrated reports of 37 mining companies listed on the JSE between 2009 and 2018; the World Bank World Integrated Solution database; StatsSA; and the annual SARB bulletins from 2009 to 2019. The mining companies integrated reports were sourced from the company websites and the SharaData online library. The source of the data used in the research is summarised in Table 5-1.

***Table 5-1: Source of research data***

| Sources | Data |
|---|---|
| SARB | • Gross domestic product<br>• Gross fixed capital formation<br>• Gross value add |
| Integrated reports of JSE-listed companies | • Market capitalisation<br>• Capital expenditure |
| StatsSA | • Mining production and sales revenue<br>• Mining and quarrying capital expenditure |
| World Bank Open Data | • Consumer price index |
| World Bank World Integrated Trade Solution | • Ores and metals exports (percentage of merchandise export) |

## 5.3 Description of Variables

The research aim was to analyse the effect of internationalisation on the mining sector's market share, capital spending and growth, and its contribution to the national economy. The proxy for internationalisation was market capitalisation. Mining production and sales revenue as a percentage of GDP and export market share (as a percentage of merchandise exports) were used as proxies for the sector's market share. StatsSA's total mining and quarrying capital expenditure and the individual reported capital expenditure of the JSE-listed mining companies were used to measure the effect of internationalisation on the sector's capital spending and growth. GFCF as a percentage of GDP and GVA as a percentage of GDP was used to measure the sector's contribution to the national economy.

### 5.3.1 Annual Integrated Reports of Mining Companies

The market capitalisation and capital expenditure data were sourced from the annual integrated reports and financial statements of JSE-listed mining companies with operations in South Africa. 37 companies were used in the research study. Table 5-2 lists the mining companies used to compile the market capitalisation and capital expenditure data. Appendix A provides a list of sources of the company integrated reports used in this research study.

***Table 5-2: Listed mining companies used in the research***

| **JSE-listed mining companies used in the research** | |
|---|---|
| 1. African Rainbow Minerals Limited | 2. Metmar Limited |
| 3. Anglo American Platinum Limited | 4. Metorex Limited |
| 5. AngloGold Ashanti Limited | 6. Mvelaphanda Resources Limited |
| 7. Assore Limited | 8. Northam Platinum Limited |
| 9. Bauba Platinum Limited | 10. Oakbay Resources & Energy Limited |
| 11. Buffalo Coal Corp | 12. Optimum Coal Holdings |
| 13. Coal of Africa-mc mining | 14. Orion Minerals Limited |
| 15. DRDGOLD Limited | 16. Palabora Mining Company Limited |
| 17. Eastern Platinum Limited | 18. Pan African Resource Plc |
| 19. Exxaro Resources Limited | 20. Petmin Limited |
| 21. Gold Fields Limited | 22. Royal Bafokeng Platinum Limited |
| 23. Gold One Limited | 24. Sephaku Holdings Limited |
| 25. Goliath Gold Mining Limited | 26. Sibanye-Stillwater Limited |
| 27. Great Basin Gold Limited | 28. Tharisa Plc |
| 29. Harmony Gold Mining Company Limited | 30. Village Main Reef Limited |
| 31. Impala Platinum Holdings | 32. Wescoal Holdings |
| 33. Afrimat Holdings | 34. Wesizwe Platinum Limited |
| 35. Kumba Iron Ore Limited | 36. Lonmin Plc |
| 37. Merafe Resource Limited | |

Table 5-3 shows the total number of companies per year used to compile market capitalisation and capital expenditure data. The number of

companies used per year was changing due to companies delisting or entering the market. In cases where companies did not report their market capitalisation, the total number of outstanding shares in a specified year was multiplied by the annual average share price. With companies that have since delisted and removed their websites, their integrated reports and financial statement were sourced from the ShareData Online Library

***Table 5-3: Number of companies used per year to calculate market capitalisation and capital expenditure***

| Year | Number of companies | Market capitalisation | Capital expenditure |
|---|---|---|---|
| 2009 | 29 | 29 | 24 |
| 2010 | 31 | 31 | 25 |
| 2011 | 30 | 29 | 23 |
| 2012 | 30 | 30 | 23 |
| 2013 | 28 | 28 | 24 |
| 2014 | 26 | 26 | 23 |
| 2015 | 28 | 28 | 25 |
| 2016 | 26 | 26 | 26 |
| 2017 | 26 | 26 | 25 |
| 2018 | 26 | 26 | 23 |

### 5.3.2 Market Capitalisation

Market capitalisation was used as a proxy for internationalisation. It can be defined as the total value of a listed company's outstanding shares at a specified share price. Most companies use the average annual share price to calculate market capitalisation. Investors use market capitalisation to compare the size of different companies and predict their future performance, and it is also used to measure the market size of business sectors and the growth trends over time.

The same institutional and macro-economic fundamentals that affect the development of local stock markets also drive companies to adopt internationalisation strategies (Claessens, et al., 2006). Improving these fundamentals, such as easing exchange controls, might have an asymmetrical effect on a domestic company's ability to internationalise and on domestic market development. As a country's institutional and macro-economic fundamentals improve, domestic companies can easily raise capital, list, and trade on foreign exchanges. However, this might result in a vicious cycle as domestic companies internationalise and have no incentive to invest in the domestic sector (Claessens, et al., 2006). In most cases, cross-listing and issuing depository receipts in international public exchange markets results in investors relocating a company away from high risk, unpredictable domestic market to low cost, lower risk, global markets (Levine & Schmuckler, 2006). This exposes the domestic company to low-cost profitable foreign markets, which results in a decline in both domestic market liquidity and sector growth.

The market capitalisation data from 2009 to 2018 were compiled from the listed company's integrated reports and financial statements. The data were adjusted to 2010 constant prices using the South African CPI sourced from the World Bank's open data website. Figure 5-1 shows the adjusted market capitalisation. The detailed market capitalisation is in Appendix B. The slope of the linear function was -81.269 indicating that market capitalisation declined sharply over the years of study. The $R^2$ value indicated that the declining trendline is a representative of the data.

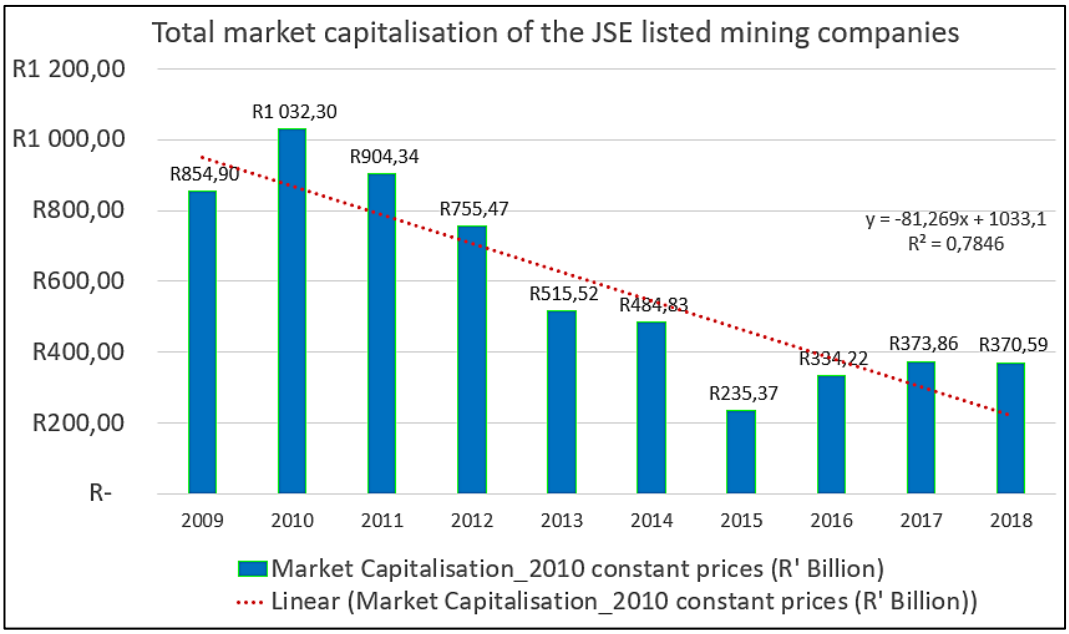



***Figure 5-1: Annual market capitalisation of JSE-listed mining companies (Source: Mining companies integrated reports)***

### 5.3.3 Capital Expenditure

A company's capital expenditure comprises of the cost of buying new fixed assets plus the cost of repairing and improving existing fixed assets to improve the performance of the company or increase its value. Fixed assets include equipment and machinery, buildings and facilities, and land.

Mining capital expenditure can be divided into start-up and stay-in-business capital expenditure (Mohutsiwa & Musingwini, 2015). Start-up capital expenditure refers to the cost incurred during the evaluation of a mining project, from discovery to commissioning stage. Stay-in business capital expenditure refers to the cost of maintaining and increasing production capacity less than the operating cost. A rise in the total capital expenditure of the sector translates into an increase in productivity, output, and scale; a decline translated into sectoral contraction.

This research used two capital expenditure statistics sources to correlate the capital spending of the mining sector with the internationalisation of

South African mining companies, namely, StatsSA's annual mining and quarrying capital expenditure figures and the individual capital expenditure of mining companies listed on the JSE. The reason for using both was to evaluate the effect of internationalisation on both the listed companies, as well as on non-listed companies. StatsSA's capital expenditure data includes companies contributing to capital spending in the sector, but which are not listed on the exchange. Figure 5-2 shows the capital expenditure for mining and quarrying and the JSE-listed companies. The contribution was calculated by differencing the total mining and quarrying capital expenditure with the capital expenditure of the JSE listed mining companies. The contribution made by the JSE-listed companies to the total mining and quarrying capital expenditure figures ranged between 48 percent and 75 percent and peaked at 75 percent in 2012. The lowest contribution was made in 2016. This research aims to evaluate if the fluctuation can be correlated to the internationalisation strategies adopted by most mining companies.

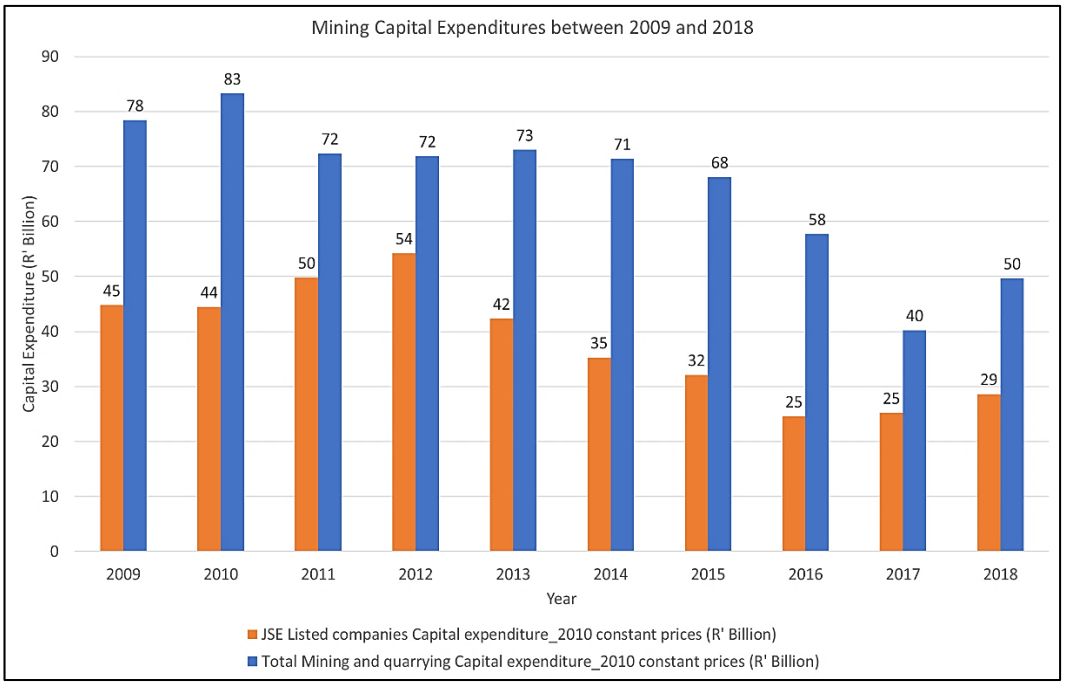



***Figure 5-2: Total mining and quarrying capital expenditure and the expenditure of JSE-listed mining companies between 2009 and 2018***

### 5.3.4 Ores and Metals Export and Mining Production and Sales Revenue

The total market share of the mining sector for the period 2009 to 2018 was measured using two variables, namely, total export revenue from South African ores and metals as a percentage of the country's total merchandise trade; and mining production and mineral sales revenue. The ores and metals export data were sourced from the World Bank's World Integrated Trade Solution. The ores and metals export data were not normalised because it is a ratio of the total ores and metals export figure and the total merchandise trade exports figure. The mining production and sales revenue data were sourced from StatsSA. The production and sales revenue data were normalised by dividing by GDP to remove non-stationary factors.

Figure 5-3 shows the trend for 2009 to 2018 for ores and metals exports, mining production and sales revenue. The mining production and mineral sales revenue data are dependent on the commodity price and output volume. This research study focused on the output volume effect. The sharp upswing in commodity price can cause a sharp increase in revenue, which could, in turn, overshadow the volume factor. The research used the correlation coefficient and the significance test to measure the underlying influence of internationalisation on output volumes.

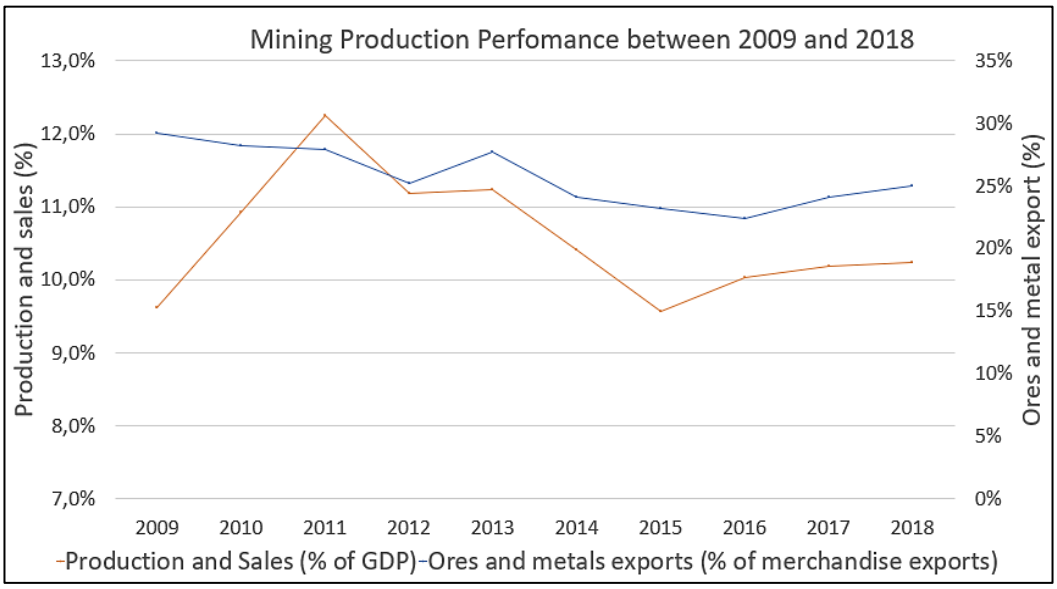



***Figure 5-3: South African mining ores and metals exports and production and sales revenues***

### 5.3.5 Gross Fixed Capital Formation and Gross Value Add

The GFCF and GVA figures were used as proxies for the economic performance of the mining sector. GFCF can be defined as the acquisition of capital stocks and equipment to be used in production as well as changes in business inventory during a given year (Ali, 2015). The research study used GFCF to measure the inflow of investment into the mining sector.

GVA was used to measure the economic output of the mining sector. It is defined as the total value of goods and services produced in a sector, less the cost of all inputs and raw materials used in the production of goods and services. The non-stationary factors related to GFCF and GVA were removed by dividing the two variables by GDP. Figure 5-4 shows the mining GFCF and GVA trends between 2009 and 2018. The mining sector's contribution to the economy was almost constant between 2009 and 2013. In 2013, the Gross Value Add contribution started to decline, the Gross Fixed Capital Formation only started to decline in 2015. This research aims to evaluate is to assess if the poor economic contribution can be correlated to the internationalisation strategy adopted by South African mining companies.

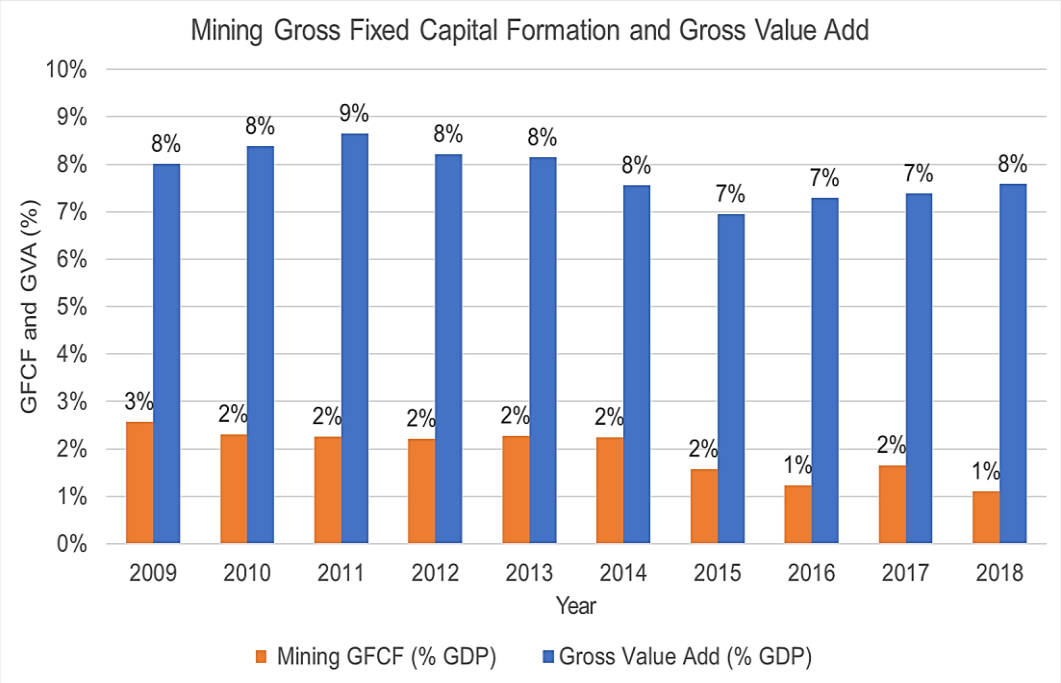



***Figure 5-4: GFCF and GVA as a percentage of GDP of the mining sector between 2009 and 2018.***

## 5.4 Data Analysis Techniques

The Spearman rank correlation coefficient technique was used to determine the magnitude and direction of the statistical association between the decline in market capitalisation as a proxy for internationalisation and the global competitiveness of the mining sector. The strength and direction of the association is expressed mathematically by the correlation coefficient ($r_s$). A significance test (p-value) was used to test the validity of the association.

The concept of correlating variables first appeared in the literature in 1846, in an article penned by Auguste Bravais titled: *Analyse Mathématique Sur Les Probabilités des Erreurs de Situation d'un Point (Mathematical Analysis on the Probability of Errors of a Point)*. The concept remained unpopular until Francis Galton made a crucial breakthrough in the development and understanding of regression and correlation in the 1889 article titled: *Co-Relations and their Measurement, chiefly from Anthropometric Data*. Galton found that the slope of the regression line could be used to describe the degree of association between two variables, if the variability of the two measurements were known (Stanton, 2001). This relationship is expressed by Equation 5.1:

$$Y = r\bar{X} \qquad \textbf{Equation 5.1}$$

Where: $(Y)$ is the deviation of one of the two variables; $(\bar{X})$ is the mean value of the corresponding variable $X$ (Galton, 1889).

In 1896, Karl Pearson used Galton's findings to derive the Pearson product-moment correlation coefficient ($r_p$), which was introduced in the 1896 article: *Mathematical Contributions to the Theory of Evolution: Regression,*

*Heredity and Panmixia*. The coefficient measured the linear relationship between interval or ratio variables using two assumptions, namely:

- both variables are normally distributed; and
- the correlated pair have equal variance or are homoscedastic.

Therefore, the coefficient can be defined as the covariance of the paired data divided by the standard deviation:

$$r_p = \frac{CoV\ (XY)}{\sigma_x \sigma_y} \qquad \textbf{Equation 5.2}$$

Where: $CoV$ is covariance; $(\sigma_x)\ and\ (\sigma_y)$ are the standard deviations.

Therefore, the standard correlation coefficient for two sets of given N samples (X and Y) is defined by Equation 5.3:

$$r_p = \frac{\sum(X - \bar{X})(X - \bar{Y})}{N\sigma_x \sigma_y} \qquad \textbf{Equation 5.3}$$

Where: $\bar{X}, \bar{Y}$ are the mean values of X and Y samples, respectively; $\sigma_x$ and $\sigma_y$ are the standard deviation given as the square root of the sample variances $\sigma_x^2$ and $\sigma_y^2$ respectively.

The sample variance ($\sigma^2$) of Y and X are calculated by Equation 5.4:

$${\sigma_y}^2 = \frac{\sum(Y-\bar{Y})^2}{N};\ {\sigma_x}^2 = \frac{\sum(\mathrm{X}-\bar{X})^2}{N} \qquad \textbf{Equation 5.4}$$

Therefore, the Pearson product-moment correlation coefficient can be expressed by Equation 5.5:

$$r_p = \frac{\sum(X - \bar{X})(\mathrm{Y} - \bar{Y})}{\sqrt{(X - \bar{X})^2 (Y - \bar{Y})^2}}$$ **Equation 5.5**

Figure 5-5 shows the different scatterplots for the different correlation relationships. The strength of the correlation is measured by the absolute value of $r_p$, which is between -1 and +1. The closer the value is to +1 and -1, the stronger the correlation. A weak correlation is recorded when the absolute value is close to 0, while 0 indicates no correlation. The positive and negative signs measure the direction of the correlation. A positive value indicates a positive correlation, which means that the dependent variable will increase with an increase in the independent variable. While a negative value indicates a negative correlation, which means that the dependent variable will decrease with an increase in the independent variable.

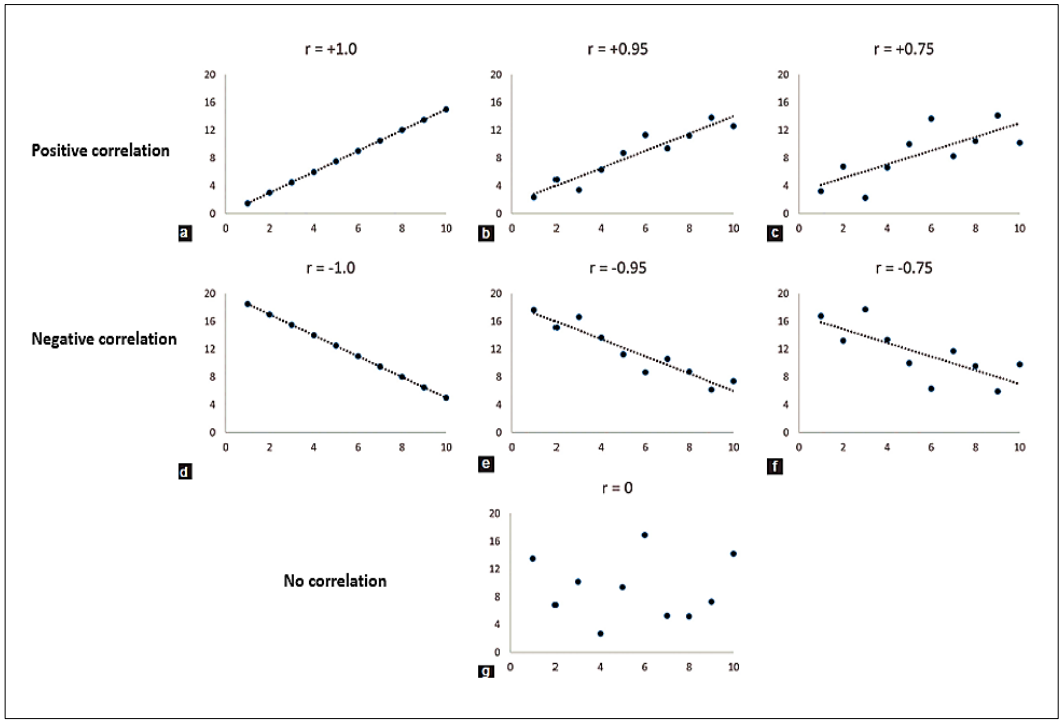



***Figure 5-5: Scatterplots showing the strength and direction of the correlation coefficients (Source: Aggarwal and Ranganathan, 2016, p. 188)***

The limitation of the Pearson product-moment correlation coefficient is that it only measures the linear relationship between two normally distributed variables. The Spearman rank correlation coefficient was used in this research because it can measure the degree of association between two variables in cases where:

- the distribution of the variables is not defined;
- the variables were measured independently of each other; and
- their relationship is non-linear.

The Spearman rank correlation coefficient uses an ordinal scale or rank order to measure the monotonic relationship between two variables. Charles Spearman introduced the method in an article published in 1904

titled: *The Proof and Measurement of Association between Two Things*. The article identified two advantages of using the Spearman rank correlation coefficient rather than the Pearson product-moment correlation. The first advantage is that the ranks allow for correlation between series with different frequencies (Spearman, 1904). The second advantage is that it reduces systematic error or deviation association, especially with sampling variation that could constrict, dilate or distort the correlation (Spearman, 1904).

Another correlation coefficient frequently used is the Kendall rank correlation coefficient, which also measures the strength and direction of ordinal scaled variables. The research study used the Spearman rank correlation coefficient because using the Kendall rank correlation coefficient could have produced the same findings for 10 pairs of samples. Th point-biserial correlation coefficient measures the strength and direction of the correlation between continuous and dichotomous variables.

### 5.4.1 Data Ranking

The Spearman rank correlation coefficient was used to measure the statistical association between market capitalisation and the market share, capital spending, growth and economic performance of the sector. Figure 5-6 illustrates the analysis steps. The first step was to rank the data in ascending order. The Spearman rank correlation coefficient was calculated for the ranks. The t-test was done to test the null hypothesis. The significance test (p-test) was done to validate the null hypothesis.

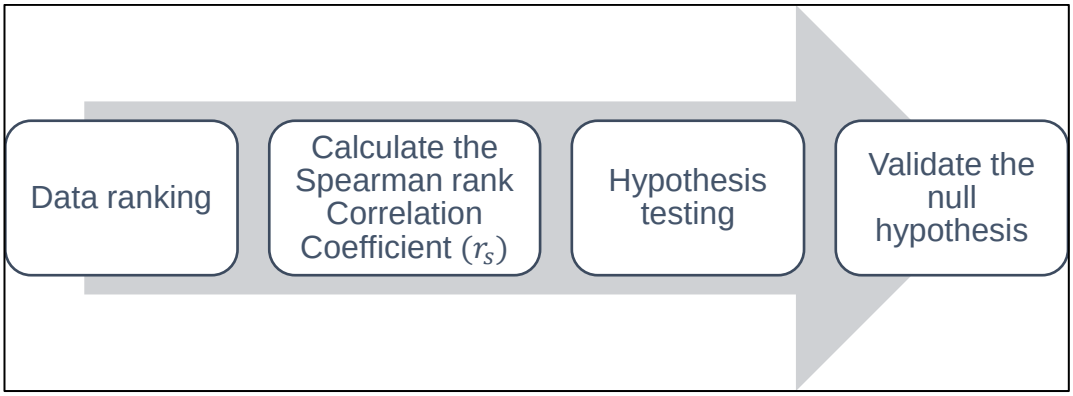



***Figure 5-6: Simplified correlation process steps***

Microsoft Excel was used to calculate the Spearman rank correlation coefficient using ten paired data points. X represented the independent variable values, market capitalisation. Y represented the dependent variable values which are ores and metals exports as a ratio of merchandise trade, mining production and sales revenue, capital expenditure, GFCF and GVA.

The first step was to rank the X and Y data using the Microsoft Excel syntax function: $RANK.AVG(number; ref; [order])$. The *number* referred to the data point being ranked; *ref* referred to the reference data set used to rank the point; *order* referred to the order of ranking, i.e., ascending or descending. The data were ranked in ascending order.

The next step was to find the difference between the paired X and Y variables ($d$). This was achieved by subtracting the Y ranked values from the X ranked values for each data pair. The next step was to calculate the square of $d$ to find $d^2$. The $d^2$ values were then added together to find $\sum d^2$, which was used to calculate the Spearman rank correlation coefficient.

### 5.4.2 Spearman Rank Correlation Coefficient

Equation 5.6 was used to calculate the Spearman rank correlation coefficient ($r_s$):

$$r_s = 1 - \sum_{i=1}^{n} [6d^2/(an^3 - n)] \qquad \textbf{Equation 5.6}$$

Where: d is the difference in the ranking of X and Y; $n$ refers to the number of paired data.

The direction of the correlation between the paired data was measured by $r_s$ as shown in Equation 5.7:

$$-1 \leq r_s \leq 1 \qquad \textbf{Equation 5.7}$$

Where:

- A positive value represents a positive correlation between the variables. i.e., a decrease in market capitalisation had a negative effect on the ability of the mining sector to compete.
- A negative value represents a negative correlation, i.e., a decrease in market capitalisation had a positive effect on the ability of the mining sector to compete.
- Zero implies no correlation.

The strength of correlation was classified using the James Evans correlation strength classification guidelines, which are summarised in Table 5-4. The classification is grouped into 5 correlation strengths based on the value of the rank correlation coefficient. The rank correlation coefficient for very weak correlation strength is between 0 and 0.19. The rank correlation

coefficient for weak correlation strength is between 0.20 and 0.39. The rank correlation coefficient for moderate correlation strength is between 0.40 and 0.59. The rank correlation coefficient for strong correlation strength is between 0.60 and 0.79. The rank correlation coefficient for very strong correlation coefficient between 0.80 and 1.0.

***Table 5-4: Evans' correlation strength classification (Evans, 1996)***

| $r_s$ values (+ or -) | Correlation strength |
|---|---|
| 0.0-0.19 | Very weak |
| 0.20-0.39 | Weak |
| 0.40-0.59 | Moderate |
| 0.60-0.79 | Strong |
| 0.80-1.0 | Very strong |

### 5.4.3 Hypothesis Testing

The student t-test was used to test the null hypothesis. The t-test was calculated using the following equation:

$$\boldsymbol{t} = r_s \sqrt{\frac{(\boldsymbol{n}-\mathbf{2})}{(\mathbf{1}-\boldsymbol{r_s}^{\mathbf{2}})}} \qquad \textbf{Equation 5.8}$$

Where:

- The null hypothesis ($\mathrm{H}_0$) is that internationalisation does not affect the competitiveness of the mining sector: $\mathrm{r}_s = 0$.
- The t-test value must be less than the critical value of 0.648, for N = 10 and $alpha(\propto) = 0.05$, for the hypothesis to be true.
- The alternative hypothesis ($\mathrm{H}_1$) is that internationalisation affects the competitiveness of the mining sector: $\mathrm{r}_s \neq 0$; and
- The t-test value must be greater than 0.648, where N = 10 and $\propto = 0.05$, for the alternative hypothesis to be true.

### 5.4.4 Significance Testing

The two-tailed significance test (p-test) was used to test the validity of the null hypothesis using the Microsoft Excel syntax function shown by Equation 5.9:

$$\boldsymbol{p = T.DIST.2T(x, deg_freedom)} \qquad \textbf{Equation 5.9}$$

Where: $T.DIST.2T$ represents the two-tailed student T distribution; $x$ is $t$ in Equation 5.8; $\deg_freedom(DF)$ equals $n - 2$.

The confidence level was set at 95 percent ($\propto = 0.05$), which means that $p \leq 0.05$ for the correlation was significant.

## 5.5 Chapter Summary

This chapter discussed the methodology used to do a correlation analysis on the effect of internationalisation on production in the mining sector, capital spending and economic performance. Market capitalisation was used as a proxy variable for internationalisation. Ores and metals exports as a percentage of merchandise trade, and mineral production and sales revenue, were used to measure the effect of internationalisation on the total market share of the sector. Capital expenditure was used to measure the effect of internationalisation on spending on fixed assets and growth. GFCF and GVA were used to measure the effect of internationalisation on the economic contribution of the mining sector.

The Spearman rank correlation coefficient was used to test the magnitude and direction of the correlation. The student t-test was used for hypothesis testing. The two-tailed p-test was used to validate the null hypothesis. The results and analysis are presented in the next chapter.

# 6 RESULTS ANALYSIS AND DISCUSSIONS

## 6.1 Chapter Overview

The aim of this chapter is to present the research results, detail the empirical analyses done and discussions. The first section provides the descriptive statistics for the data used in the research. The second section presents the results. The third section discusses the research results.

## 6.2 Descriptive Statistics

A descriptive statistical analysis was done on the research data to justify the correlation method used for analysis. It included calculating the mean, median, standard deviation (std dev), skewness and kurtosis. The total number of samples used per variable was ten. Table 6-1 presents the results of the descriptive statistics.

***Table 6-1: Descriptive statistics for the variables used in the research***

| Variables | Mean | Median | Std Dev | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Market capitalisation | 586.14 | 500.176 | 277.787 | 0.422 | -1,429 |
| Ores and metals exports | 25.703 | 25.115 | 2.392 | 0.166 | -1,562 |
| Mining: Production and sales revenue | 0.106 | 0.103 | 0.008 | 0.787 | -1,5628 |
| JSE-listed companies' CAPEX | 38.151 | 38.822 | 10.448 | 0.072 | -1,397 |
| Mining and quarrying CAPEX | 66.614 | 71.643 | 13.354 | -0.986 | 0,273 |
| GFCF | 0.019 | 0.022 | 0.005 | -0.650 | -1,126 |
| Gross Value Add | 0.078 | 0.078 | 0.005 | -0.032 | -1,067 |

The mean and median were used to test the normality of the distributions. The skewness and kurtosis were used to measure the deviation of the distribution from symmetry, as well as the shape of the distribution. The descriptive statistics analysis found that the GVA mean was equal to the median, which indicated that the GVA population had a normal distribution. The mean of the market capitalisation was greater than the median, with a skewness of 0.422 and a kurtosis of -1.429. The analysis indicated that market capitalisation had a slightly positive skewed distribution with a light tail.

The median of the mining and quarrying capital expenditure was greater than the mean. The skewness of the distribution was -0.986, and the kurtosis was 0.273. This indicated that the distribution was moderately negative skewed with a heavy tail. The two mining sector market share distributions have a positive skewness with a light tail. The capital expenditure distribution of the JSE-listed mining companies was symmetrical with a light tail. The GFCF had a moderately negative skewness with a light tail.

The Spearman rank correlation coefficient was chosen as the method of analysis. The advantage of using the Spearman rank correlation coefficient compared to the Pearson product-moment correlation coefficient is that the ranks in the Spearman coefficient allow for correlation between series with different distributions. Correlation methods are usually used to determine: a statistical relationship between two variables such as the strength and direction of the statistical relationship. The extent to which the dependent variable can explain the variability of the independent variable (Armstrong, 2019). The Pearson product-moment correlation coefficient is widely used to analyse the statistical relationship between two variables. This method requires that both the independent and dependent variables be normally distributed and homoscedastic (equal variance). The descriptive statistics analysis found that the variables were measured independently and that

their relationship with market capitalisation was mostly non-linear. The Spearman rank correlation coefficient was used because it does not require both variables to be normally distributed and homoscedastic. It uses the ordinal scale or rank orders to determine the monotonic relationship between two variables.

### 6.3 Presentation of Research Results

The Spearman rank correlation coefficients were calculated using Microsoft Excel. The original data were normalised before the analyses. The market capitalisation and capital expenditure data were adjusted from nominal to 2010 constant prices using the South African consumer price index, using 2010 as the base year. The aggregated economic data were normalised by dividing it by GDP. The aggregated economic data included the mining production and sales revenue, GFCF and GVA. The ores and metals export figures were not normalised, because these were calculated as a ratio of the ores and metals export figures to total merchandise trade exports.

The first step was to rank the dependent and independent variables in ascending order by value. This was followed by subtracting the dependent variable from the values of the independent variable to get the difference $(d)$. The differences were individually squared to get $\mathrm{d}^2$. The individual $\mathrm{d}^2$ were added together to get the total $\sum d^2$. The Spearman rank correlation coefficient $(\mathrm{r_s})$ was calculated using Equation 5.6. The t-test or t-statistics were calculated using Equation 5.8. The degree of freedom used in the research was calculated using the equation $(\mathrm{n}-2)$, where n is the number of samples used per variable. A two-tailed probability test (p-test) was done to test the validity of the null hypothesis using Equation 5.9. The confidence level for the analysis was set at 95 percent ($\propto = 0.05$), which meant that $\mathrm{p} \leq 0.05$ for the correlation to be significant. The results of the analysis are summarised in Table 6-2.

***Table 6-2: Spearman rank correlation results***

| Dependent variables | $d^2$ | N | $r_s$ | t-test | DF | p-value (2-tailed) |
|---|---|---|---|---|---|---|
| Ores and metals exports as a percentage of merchandise trade | 16 | 10 | 0.903 | 5.946 | 8 | 0.00034 |
| Mining: Production and sales revenue | 62 | 10 | 0.624 | 2.260 | 8 | 0.0537 |
| JSE-listed mining companies capital expenditure | 32 | 10 | 0.806 | 3.852 | 8 | 0.0049 |
| Mining and quarrying capital expenditure | 30 | 10 | 0.818 | 4.025 | 8 | 0.0038 |
| GFCF | 26 | 10 | 0.842 | 4.422 | 8 | 0.0022 |
| GVA | 14 | 10 | 0.915 | 6.421 | 8 | 0.00020 |

The values of all six correlations were positive, indicating a positive statistical relationship between market capitalisation and the mining sector's market share, capital spending and economic contribution. The t-test method or t-statistic was used for the hypothesis testing. The confidence level for the analysis was set at 95 percent ($\propto = 0.05$). The research null hypothesis ($H_0$) was:

> $H_0: r_s = 0$: Internationalisation does not affect the competitiveness of the mining sector.

To accept the null hypothesis, the t-test value must be less than the critical value for N = 10 and $\propto = 0.05$, which is 0.648. The alternative hypothesis ($H_1$) was:

> $H_1: r_s \neq 0$: Internationalisation affects the competitiveness of the mining sector.

To reject the null hypothesis, the t-test value must be greater than the critical value of 0.648 for N = 10 and $\propto = 0.05$. The t-test values rejected the null hypothesis. The two-tailed probability test (the p-test) was used to test the validity of the null hypothesis. the p-value for the correlations were less than 0.05 except for mining production and sales revenue which was greater than 0.537

### 6.3.1 Market Share Correlations Analysis

This research study aimed to analyse the effect of the internationalisation strategy adopted by most South African companies on the mining sector's market share. The variables used to measure market share were and metal export as a percentage of merchandise trade, mining production and sales revenue.

The correlation results for ores and metal exports as a percentage of the merchandise trade are summarised in Table 6-3. The correlation coefficient of the ores and metal export as a percentage of merchandise trade was 0.903, the t-test was 5.946 and the 2 tailed p-value was 0.0034. The correlation coefficient was greater than 0.8 and 1.0 implying a very strong correlation. The t-test was greater than the critical value of 0.648 for 10 pairwise (n=10) and $\propto = 0.05$. The two-tailed p-test was less than 0.05. The t-test and p-test successfully rejected the null hypothesis. The correlation analysis successfully correlated that the internationalisation strategy adopted by South African mining companies affected the ores and metal exports as a percentage of merchandise trade.

***Table 6-3: A correlation Results of Ores and Metals Exports as a Percentage of the Merchandise Trade***

| Correlation Analysis of Ores and Metals Exports as a Percentage of the Merchandise Trade | |
|---|---|
| Sum | 16,000 |
| Number of pairwise (n) | 10,000 |
| $r_s$ (rho) | 0,903 |
| T Statistics (t-test) | 5,946 |
| Degree of Freedom | 8,000 |
| p value (1 tailed) | 0,00017 |
| p value (2 tailed) | 0,00034 |

The results for the correlation analysis of the mining production and sales revenue are summarised in Table 6-4. The correlation coefficient was 0.624, the t-test value was 2.260, and the two-tailed p test was 0.054. The correlation coefficient was between 0.60 and 0.79 which indicated a strong statistical relationship. The t-test value was greater than 0.648 for n=10 and $\propto = 0.05$. The p-test value was greater than 0.05. The correlation analysis for the effect of internationalisation on mining production and sales revenue failed to reject the null hypothesis

***Table 6-4: A Correlation Results of mining Production and Sales Revenue***

| Correlation Analysis of Mining Production and Sales Revenue | |
|---|---|
| Sum | 62,000 |
| Number of pairwise (N) | 10,000 |
| $\mathbf{r_s}$ (rho) | 0,624 |
| T Statistics (t-test) | 2,260 |
| Degree of Freedom | 8,000 |
| p value (1 tailed) | 0,027 |
| p value (2 tailed) | 0,054 |

### 6.3.2 Capital Spending correlation Analysis

This research study aimed to analyse the effect of the internationalisation strategy adopted by most South African companies on the mining sector's

capital spending. The variables used to measure the capital expenditure were the capital expenditure of the JSE listed mining companies and the mining and quarrying capital expenditure.

The correlation results for capital expenditure of the JSE-listed mining companies are summarised in Table 6-5. The correlation coefficient was between 0.8 and 1.0 which indicated a very strong statistical relationship. The t-test values were greater than 0.648. The two-tailed probability test was less than 0.05. The internationalisation strategy adopted by South African mining companies affected the capital expenditure of the JSE-Listed mining companies.

***Table 6-5: A Correlation Results for capital expenditure of the JSE-Listed mining companies***

| **Correlation Analysis of Capital Expenditure of JSE-Listed mining companies** | |
|---|---|
| Sum | 32,000 |
| Number of pairwise (N) | 10,000 |
| $r_s$ (rho) | 0,806 |
| T Statistics (t-test) | 3,852 |
| Degree of Freedom | 8,000 |
| p value (1 tailed) | 0,0024 |
| p value (2 tailed) | 0,0049 |

The results for correlation analysis of the total mining and quarrying capital expenditure are summarised in Table 6-6. The Spearman Rank Correlation Coefficient was between 0.8 and 1.0. which implied a very strong positive correlation. The t-test value was greater than 0.648 and the probability test value was greater than 0.05. The internationalisation strategy adopted by South African mining companies affected the mining and quarrying capital expenditure.

***Table 6-6: A Correlation Results for the total mining and quarrying capital expenditure***

| Correlation Analysis of Total Mining and Quarrying Capital Expenditure | |
|---|---|
| Sum | 30,000 |
| Number of pairwise (N) | 10,000 |
| $r_s$ (rho) | 0,818 |
| T Statistics (t-test) | 4,025 |
| Degree of Freedom | 8,000 |
| p value (1 tailed) | 0,0019 |
| p value (2 tailed) | 0,0038 |

### 6.3.3 Economic Performance Correlation Analysis

This research study aimed to analyse the effect of the internationalisation strategy adopted by most South African companies on the mining sector's economic performance. The variables used to measure the economic performance were Gross Fixed Capital Formation and Gross Value Add.

The correlation results for GFCF are summarised by

Table 6-7. The correlation coefficient was between 0.8 and 1.0 which indicated a very strong statistical relationship. The t-test values were greater than 0.648 for n=10 and $\propto = 0.05$. The two-tailed probability test was less than 0.05. The internationalisation strategy adopted by South African mining companies affected the mining sector's Gross Fixed Capital Formation contribution.

***Table 6-7: A Correlation Results for the Gross Fixed Capital Formation***

| Correlation Analysis of Gross Fixed Capital Formation | |
|---|---|
| Sum | 26,000 |
| Number of pairwise (N) | 10,000 |
| $r_s$ (rho) | 0,842 |
| T Statistics (t-test) | 4,422 |
| Degree of Freedom | 8,000 |
| p value (1 tailed) | 0,0011 |
| p value (2 tailed) | 0,0022 |

The correlation results for GVA are summarised by

Table 6-7. The correlation coefficient value was 0.914 which is greater than 0.8. This indicated a very strong statistical relationship. The t-test value was 6.421 for n=10 and $\propto = 0.05$. The two-tailed probability test was less than 0.05. The internationalisation strategy adopted by South African mining companies affected the mining sector's Gross Value Add contribution.

***Table 6-8: A Correlation Results for the Gross Value Add***

| Correlation Analysis of Gross Value Add | |
|---|---|
| Sum | 14,000 |
| Number of pairwise (N) | 10,000 |
| $r_s$ (rho) | 0,915 |
| T Statistics (t-test) | 6,421 |
| Degree of Freedom | 8,000 |
| p value (1 tailed) | 0,00010 |
| p value (2 tailed) | 0,00020 |

## 6.4 Discussion of Research Results

The study found that the internationalisation strategy adopted by South African corporations negatively affected the ability of the mining sector to sustain its global competitiveness. Market capitalisation was used as a proxy for internationalisation. The competitiveness was measured by the change in market share, capital spending, and contribution to the national economy. The market share variables were ores and metals exports as a percentage of merchandise trade, mining production and sales revenue. The capital spending variables were the capital expenditure of JSE-listed mining companies between 2009 and 2018; annual mining and quarrying capital expenditure reported by StatsSA. The economic contribution variables were GFCF and GVA.

The scatterplots for the rank correlation analysis are shown in Figure 6-1. The scatterplots show a positive, significant relationship between market capitalisation and the mining sector's market share, capital spending and contribution to the national economy.

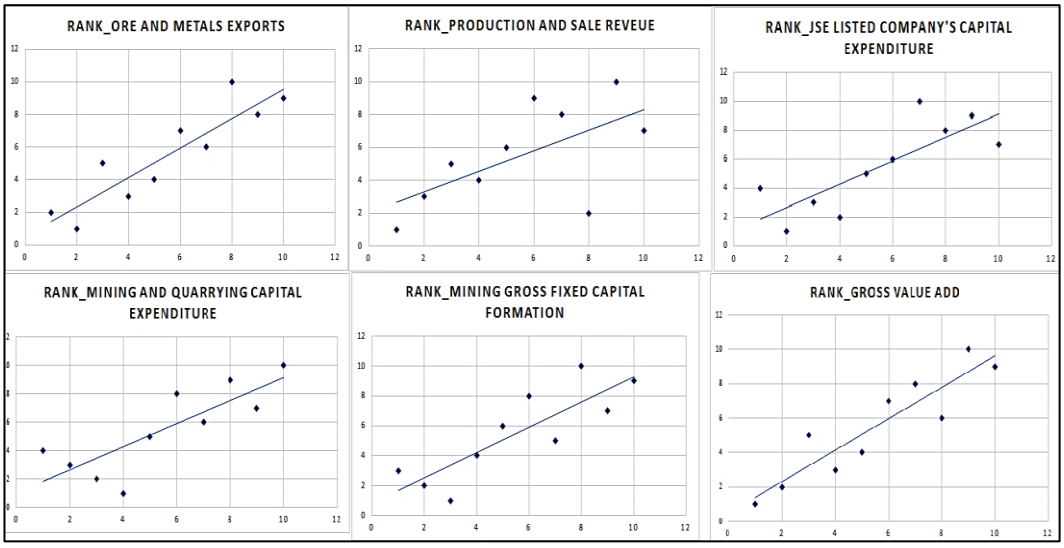



***Figure 6-1: Scatterplots of the Spearman rank correlation coefficient***

The research study found two positive correlation coefficients for the market share variables. However, the correlation of mining production and sales

revenue failed to reject the null hypothesis. These findings indicate that the internationalisation strategy adopted by South African mining companies have to an extent negatively affected the mining sector's ores and metal export as a percentage of merchandise trade. The study found two positive correlation coefficients for the capital spending variables. The t-test and probability test values were able to reject the null hypothesis. The decline in capital spending in the mining sector was correlated with a decline in market capitalisation. The rank correlation analysis between market capitalisation and economic performance variables found a very strong positive statistical relationship. The decline in the economic contribution of the mining sector was also very strongly correlated to the decrease in market capitalisation.

Section 2.6 reviewed the different mechanisms through which internationalisation can affect the competitiveness of the home country. One of the mechanisms reviewed was the displacement of domestic exports. The other mechanism was the use of domestic capital to finance global expansion, but which reduces domestic investment in the process.

The mechanism whereby internationalisation displaces domestic exports is the key focus of the literature. Most arguments are based on whether the type of internationalisation method used is vertical or horizontal. Vertical internationalisation involves relocating parts of the production chain abroad and increasing the demand for domestic exports (Al-Sadig, 2013). Horizontal internationalisation results in a substitution effect, as companies substitute exports from the home country with exports from other newly acquired subsidiaries abroad. The internationalisation strategy adopted by most South African mining companies could be considered as horizontal internationalisation. These companies adopted an internationalisation strategy to find Mineral Resources abroad that could offset their expensive and inefficient South African mining operations.

The other way that internationalisation can affect the competitiveness of the home country is when companies use capital allocated to domestic investment to fund global expansion. This reduces the financial liquidity available to finance domestic markets (Al-Sadig, 2013). Feldstein (1995) found that each dollar of outbound FDI reduces the domestic capital stock by US$0.20 to US$0.40. Al-Sadig (2013) found that a percent increase in outward FDI led to a 29 percent decrease in domestic investment. The mining sector is a capital-intensive sector. A large amount of capital is required to develop a mine and maintain its output. This research found that capital expenditure by South African mining companies has been declining along with the decline in market capitalisation. This implied that South African mining companies have been using capital accumulated from their South African operations to fund their global expansions. The effects of the decline in capital spending on South African operations are operational interruptions due to deterioration of the machinery, a decline in profitability, labour unrest, divestment and mine closure.

The relaxation of exchange controls was introduced to resolve the economic problems caused by international sanctions before 1994 and to upscale the economic development of the country to the level of the global market (Carmody, 2002). Upscaling of the South African mining sector to the global level required structural reforms that addressed the factors that influence the investor's decision on which mining jurisdiction to invest in. These factors include geological, political, investment promotion, operational, financial, regulatory, fiscal, profit, environmental and social. While the issue of property ownership and nationalisation continue to amplify the political instability of the country, the ongoing iteration of the mining regulations and legislation have also played a significant role in deterring investment in the mining sector.

Table 6-9 outlines the timeline of the introduction of the South African mining regulations and acts. The Geoscience Act of 1993 was developed to

establish, compile, store and publish geological data and information. The Act was later amended in 2010. This Act still regulates the availability and accessibility to geological data in the country The Mine Health and Safety Act (MHSA) of 1996 was the first law specific to mining to be enacted after the 1994 reintegration into the world economy. The National Environmental Act of 1998 followed. The development of the fundamental mining law followed, with the introduction of the Mineral and Petroleum Resources Development Act (MPRDA) of 2002. This Act was subsequently amended in 2008. The MPRDA aimed to provide access to Mineral Resources and to facilitate sustainable development. The Broad-Based Socio-Economic Empowerment charter, also referred to as the Mining Charter, was introduced in 2002, and later updated in 2010, 2014 and 2018. The objectives of the Mining Charter were to address the socio-economic inequalities seen in the sector for centuries and to facilitate equitable sharing of the resources extracted from the country. The Mineral and Petroleum Resources Royalty Act of 2008 (MPRRA) was introduced in 2002 and enacted in 2008. The MPRRA aimed to define the fiscal structures for the development of mineral and petroleum resources.

***Table 6-9: The timeline of the introduction of mining regulations and acts.***

| Year | Mining Regulations and Acts |
|---|---|
| 1993 | Geoscience Act of 1993 |
| 1996 | Mine Health and Safety Act of 1996 |
| 1998 | National Environmental Act of 1998 |
| 2002 | Mineral and Petroleum Resource Development Act of 2002 and Mining Charter |
| 2008 | Mineral and Petroleum Royalty ACT OF 2008 |
| 2010 | Mining Charter Amendments, and Geoscience Act Amendments |
| 2014 | Mining Charter Amendments |
| 2018 | Mining Charter Amendments |

The effect of the introduction of most of these acts and regulations is mostly overshadowed by other external and internal factors that affected the overall performance of the sector. The country's political instability and the re-integration into the world economy between 1993 and 1998 overshadowed the effect of the introduction of the Geoscience Act of 1993, the MHSA of 1996, and the National Environmental Act of 1998. The commodity super-cycle overshadowed the introduction of the MPRDA and 2002 mining charter. The MPRRA of 2008 was introduced while the sector was in turmoil due to the 2008 Global Financial Crisis. The subsequent iterations of the mining charter in 2010, 2014 and 2018 had a major effect on mining investments. The average lead time to transform mining investment into profit is 15-20 years. Based on the current amendment frequency of the Mining Charter, an investment will be exposed to five to six regulatory changes before a profit can be realised. The above-inflation cost of electricity, and the production disruptions caused by load shedding and labour unrest, increasing cost of production, the lack of sufficient public investment infrastructure to allow the ease of flow of the output from the mine to the market are some of the additional challenges that the mining sector must overcome.

Liberalisation of the country's exchange controls has undoubtedly provided South African mining companies with an opportunity to expand into foreign markets and reduce their exposure to challenges that continue to plague the sector. Therefore, the South African mining sector must find ways to attract and sustain investment if it is to regain its competitive advantage.

## 6.5 Chapter Summary

The aim of this chapter was to present the research results, detail the empirical analysis and discussions. The descriptive statistics showed that the variables used in the research had different probability distributions. The Spearman rank correlation coefficient was chosen as a suitable correlation

method because it does not require the variables to be normally distributed and homoscedastic.

The correlation analysis found a robust, statistically significant association between market capitalisation and GVA, ores and metals exports as a percentage of merchandise trade, GFCF and capital expenditure. The correlation analysis found a strong relationship between market capitalisation and mining production and sales revenue. However, this relationship failed to reject the null hypothesis. These results indicate that the internationalisation strategies of South African mining companies have negatively affected the ability of the mining sector to compete globally. The South African mining sector must find ways to attract and sustain investment if it intends to regain its competitive advantage. The next chapter concludes the study and provides recommendations.

# 7 CONCLUSIONS AND RECOMMENDATIONS

## 7.1 Chapter Overview

This chapter concludes the research study. It summarises each chapter and provides recommendations for future research.

## 7.2 Summary and Conclusions

The aim of this research was to analyse how the internationalisation strategy adopted by most South African companies has affected the ability of the mining sector to compete globally. Internationalisation is defined as the process by which a company gradually increases its international footprint by establishing operations in foreign markets.

The motives behind internationalisation include market seeking, resource seeking, efficiency-seeking and strategic asset seeking. The determinants of internationalisation include policy and non-policy determinants. Policy determinants include trade openness, product-market regulation, labour market arrangements, the corporate tax rate, and infrastructure. Non-policy determinants include market size, distance, factor proportionality, political stability, and economic instability.

The motives for internationalisation in the mining sector vary across the mine value chain. Resource-seeking is the fundamental motivation for mining internationalisation. Market seeking motives are associated with internalisation advantages such as reduced transaction cost. The efficiency-seeking motive is dominant in the production and refining stage of the mining value chain, as economies of scale are essential for ensuring profitability. Strategic asset seeking internationalisation occurs where mining companies acquire mineral resources to erect market barriers to address the shortfall in the home country, and to access new technology.

The determinants of internationalisation in the mining sector can be classified as geological, political, investment promotion, operational, financial, regulatory, fiscal, profit, environmental and social.

The Spearman Rank Correlation Coefficient was used to analyse the statistical relationship between the internationalisation strategy adopted by South African mining companies and the domestic mining sector's market share, capital spending and contribution to the national economy. The correlation analysis found the internationalisation strategy adopted by most South African mining companies affected:

- the market share of the mining sector negatively:
- the mining sector's capital spending negatively: and
- the contribution of the mining sector to the national economy negatively.

The research found that the internationalisation strategy adopted by South African mining companies affected the ability of the mining sector to sustain its global competitiveness negatively. These companies took advantage of the relaxation of capital controls and used the capital accumulated from South African operations during the isolated period to fund their global expansions. The global expansions were mostly horizontal internationalisation that resulted in a substitutional effect, leaving South African operations cash-constrained and struggling to fund domestic expansion projects. The mining sector must find ways to attract and sustain investment if it intends to regain its competitive advantage.

## 7.3 Recommendations

The South African mining sector requires adequate domestic and foreign investment to finance the required exploration and development of

resources. These investments require a transparent and stable environment that enables profit expropriation and maximisation. This research study recommends that:

- The South African government must develop policies to address the declining market share, capital spending and economic contribution.
- The South African government considers public-private partnership subsidised investment methods to offset the investment decline.

## 7.4 Recommendations for Future Research

The globalised international markets require that countries keep track of the global competitiveness of their various sectors. This will enable them to take a proactive approach towards the growth and development of their economic sectors. This study recommends future research in the following areas:

- Analyse the relationship between internationalisation and the capital spending of individual mining companies on their South African operations. The future of the mining company relies on capital spending on mining operations and projects.
- How has internationalisation affected the different mining industries, such as the gold and platinum group metals, diamonds, iron ore, and manganese? This will enable policymakers to take appropriate steps to capture any decline before it becomes a crisis.
- This research could also be extended to a causation analysis study between internationalisation and the competitiveness of the domestic mining sector.

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# APPENDICES

## Appendix A: Intergraded Reports

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## Appendix B: Market Capitalisation of Mining Companies (ZAR bil)

| Companies | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| African Rainbow Minerals | 27.50 | 33.30 | 40.20 | 35.70 | 32.20 | 40.50 | 18.00 | 20.06 | 18.37 | 23.97 |
| Anglo American Platinum | 188.80 | 182.80 | 143.47 | 120.37 | 106.23 | 91.99 | 49.98 | 71.31 | 94.91 | 145.07 |
| AngloGold Ashanti Limited | 122.12 | 137.00 | 117.80 | 98.61 | 45.47 | 38.07 | 36.74 | 62.98 | 55.59 | 68.64 |
| Assore Limited | 13.20 | 19.30 | 30.70 | 41.70 | 44.67 | 32.37 | 14.45 | 25.13 | 27.20 | 40.84 |
| Bauba Platinum Limited | | | | | | | | | 0.25 | 0.24 |
| Buffalo Coal Corp | | | | 2.96 | 1.31 | 0.96 | 0.25 | 0.33 | 0.23 | 0.23 |
| MC Mining | 27.78 | 32.40 | 23.24 | 14.37 | 5.21 | 2.09 | 2.48 | 1.72 | 1.24 | 0.68 |
| DRDGOLD Limited | 2.28 | 1.31 | 1.26 | 2.06 | 2.03 | 1.18 | 1.01 | 3.68 | 1.79 | 1.58 |
| Eastern Platinum Limited | 46.70 | 100.39 | 42.42 | 13.64 | 0.65 | 1.32 | 0.74 | 0.60 | 0.30 | 0.15 |
| Exxaro Resources Limited | 37.00 | 48.00 | 60.00 | 60.00 | 52.45 | 37.06 | 15.48 | 32.05 | 58.29 | 49.45 |
| Gold Fields Limited | 69.10 | 86.90 | 90.20 | 68.00 | 30.79 | 34.30 | 29.60 | 35.77 | 44.45 | 40.53 |
| Gold One Limited | 0.05 | 2.05 | 5.23 | 4.46 | 0.73 | | | | | |
| Goliath Gold Mining Limited | 0.09 | 0.09 | 0.17 | 0.48 | 0.32 | 0.27 | 0.22 | | | |
| Great Basin Gold Limited | 4.41 | 8.20 | 3.69 | 3.04 | | | | | | |
| Harmony Gold Mining Company | 34.10 | 34.89 | 38.70 | 33.00 | 15.60 | 13.60 | 6.80 | 22.90 | 9.50 | 10.60 |
| Impala Platinum Holdings | 107.66 | 113.71 | 115.09 | 85.48 | 58.80 | 67.57 | 34.00 | 35.00 | 27.00 | 14.00 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Afrimat Holdings | 0.26 | 0.44 | 0.46 | 0.79 | 1.21 | 1.83 | 2.36 | 3.39 | 4.15 | 3.96 |
| Kumba Iron Ore Limited | 97.73 | 136.65 | 161.03 | 183.20 | 142.80 | 77.27 | 13.30 | 51.00 | 122.00 | 91.00 |
| Lonmin Plc | 14.24 | 35.89 | 27.96 | 27.17 | 21.50 | 95.61 | 9.88 | 10.17 | 3.55 | 2.35 |
| Merafe Resource Limited | 3.44 | 4.11 | 2.29 | 1.72 | 2.05 | 2.36 | 1.71 | 4.14 | 4.14 | 3.57 |
| Metmar Limited | 0.60 | 0.73 | 0.98 | 0.58 | 0.48 | 0.41 | 0.52 | | | |
| Metorex Limited | 2.23 | 5.25 | | | | | | | | |
| Mvelaphanda Resources | 1.99 | 3.44 | | | | | | | | |
| Northam Platinum Limited | 10.80 | 16.41 | 16.24 | 8.89 | 12.24 | 18.09 | 20.52 | 21.92 | 20.62 | 30.10 |
| Oakbay Resources & Energy | | | | | | 8.5 | 14.40 | 16.40 | | |
| Optimum Coal Holdings | | 7.49 | 6.80 | | | | | | | |
| Orion Minerals Limited | | | | | | | | | | 0.99 |
| Palabora Mining Company | 5.12 | 5.51 | 6.69 | 5.07 | | | | | | |
| Pan African Resource Plc | 0.99 | 0.96 | 1.62 | 1.62 | 3.83 | 4.02 | 3.30 | 7.30 | 5.30 | 3.0 |
| Petmin Limited | 1.03 | 1.23 | 1.44 | 1.70 | 1.40 | 0.82 | 0.66 | 0.79 | | |
| Royal Bafokeng Platinum | | 10.95 | 9.08 | 9.52 | 9.80 | 10.95 | 5.11 | 6.97 | 5.48 | 5.57 |
| Sephaku Holdings Limited | 0.38 | 0.55 | 0.56 | 0.47 | 1.13 | 1.28 | 1.90 | 0.91 | 0.59 | 0.42 |
| Sibanye-Stillwater Limited | | | | 9.50 | 9.04 | 20.30 | 20.90 | 23.60 | 34.30 | 22.70 |
| Tharisa Plc | | | | | | | 1.28 | 4.40 | 5.10 | 4.60 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Village Main Reef Limited | 0.40 | 0.40 | 0.74 | 1.62 | 0.44 | | | | | |
| Wescoal Holdings | 0.10 | 0.17 | 0.15 | 0.12 | 0.12 | 0.36 | 0.35 | 0.34 | 0.80 | 0.73 |
| Wesizwe Platinum Limited | 1.40 | 1.79 | 1.50 | 2.95 | 2.94 | 1.29 | 0.67 | 1.24 | 0.88 | 0.68 |
| **TOTAL (ZAR bil)** | **821.51** | **1032.30** | **949.71** | **838.79** | **605.43** | **604.33** | **306.61** | **464.10** | **546.03** | **565.65** |

## Appendix C: Capital Expenditure Data (ZAR bil)

| Companies | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| African Rainbow Minerals | 3.33 | 2.74 | 3.49 | 4.32 | 3.49 | 2.92 | 3.33 | 2.35 | 2.38 | 2.46 |
| Anglo American Platinum | 11.30 | 7.99 | 7.50 | 6.79 | 6,35 | 5.75 | 3.75 | 3.40 | 3.96 | 4.71 |
| AngloGold Ashanti | 3.23 | 3.10 | 3.86 | 4.78 | 4.34 | 2.86 | 2.63 | 2.67 | 2.00 | 0.97 |
| Assore Limited | 2.78 | 3.34 | 4.10 | 4.52 | 4.06 | 3.64 | 3.84 | 2.97 | 2.82 | 3.08 |
| Bauba Platinum Limited | | | | | | | | | 0.01 | 0.07 |
| Buffalo Coal Corp | | | | | | | 0.05 | 0.003 | 0.002 | |
| Coal of Africa-mc | 0.70 | 2.35 | 1.37 | 2.19 | 2.46 | 2.07 | 1.77 | 1.58 | 1.77 | 1.10 |
| DRDGOLD Limited | 0.35 | 0.32 | 0.34 | 0.35 | 0.38 | 0.16 | 0.11 | 0.10 | 0.12 | 0.13 |
| Eastern Platinum | 0.04 | 0.09 | 0.09 | 0.09 | 0.01 | 0.17 | 0.18 | 0.17 | 0.002 | 0.02 |
| Exxaro Resources | 1.98 | 2.67 | 4.93 | 5.33 | 4.76 | 3.20 | 2.39 | 2.78 | 3.92 | 5.79 |
| Gold Fields Limited | 3.64 | 4.51 | 4.89 | 5.66 | 0.19 | 0.33 | 1.00 | 1.03 | 0.87 | 0.77 |
| Gold One Limited | 0.01 | 0.04 | 0.04 | 0.09 | 0.17 | | | | | |
| Great Basin Gold L | 0.05 | 0.46 | 1.17 | | | | | | | |
| Harmony Gold Mining Company Limited | 2.60 | 2.88 | 2.86 | 2.62 | 2.61 | 2.36 | 2.66 | 2.71 | 2.35 | 2.72 |
| Impala Platinum | 5.29 | 3.82 | 4.79 | 4.91 | 4.81 | 3.16 | 3.32 | 2.58 | 2.59 | 3.32 |
| Afrimat Holdings | 0.12 | 0.04 | 0.05 | 0.06 | 0.06 | 0.10 | 0.14 | 0.11 | 0.11 | 0.14 |
| Kumba Iron Ore Limited | 4.00 | 4.72 | 5.85 | 5.92 | 6.53 | 8.45 | 6.75 | 2.35 | 3.10 | 4.50 |
| Lonmin Plc | 2.11 | 2.16 | 2.91 | 3.96 | 1.50 | 0.99 | 1.64 | 1.27 | 1.34 | |
| Merafe Resource | | | | 0.60 | 0.61 | 0.44 | 0.30 | 0.29 | 0.40 | 0.41 |
| Metorex Limited | 0.21 | 0.01 | | | | | | | | |
| Mvelaphanda Resources Limited | 0.03 | 0.03 | | | | | | | | |
| Northam Platinum | 0.33 | 0.36 | 0.96 | 2.03 | 1.85 | 0.89 | 1.10 | 1.17 | 1.65 | 3.78 |
| Oakbay Resources | | | | | | | 0.09 | 0.03 | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Optimum Coal Holdings | | 0.41 | 0.79 | | | | | | | |
| Palabora Mining Company Limited | 0.13 | 0.22 | 0.45 | 0.37 | | | | | | |
| Pan African Resource | 0.06 | 0.07 | 0.08 | 0.13 | 0.38 | 0.36 | 0.35 | 0.30 | 0.61 | 1.65 |
| Petmin Limited | 0.29 | 0.12 | 0.36 | 0.67 | 0.64 | 0.57 | 0.48 | 0.53 | | |
| Royal Bafokeng Platinum Limited | | 0.97 | 1.16 | 1.17 | 1.04 | 1.68 | 2.01 | 1.13 | 2.16 | 3.46 |
| Sephaku Holdings | | | | | 0.01 | 0.04 | 0.03 | 0.03 | 0.01 | 0.02 |
| Sibanye-Stillwater | | | | 3.07 | 2.90 | 3.25 | 3.35 | 3.82 | 3.41 | 3.43 |
| Tharisa Plc | | | | | | | 0.30 | 0.18 | 0.35 | 0.63 |
| Village Main Reef | | | 0.14 | 0.15 | 0.17 | | | | | |
| Wescoal Holdings | | | | | | 0.17 | | 0.17 | 0.11 | |
| Wesizwe Platinum | 0.02 | 1.05 | 0.14 | 0.43 | 0.45 | 0.43 | 0.33 | 0.39 | 0.78 | 0.58 |
| **JSE-Listed total** | **43.04** | **44.47** | **52.31** | **60.21** | **49.74** | **43.99** | **41.85** | **34.13** | **36.82** | **43.74** |
| **Mining and Quarrying (ZAR Bil)** | **75.365** | **83.269** | **76.021** | **79.808** | **85.766** | **89.005** | **88.681** | **80.173** | **58.784** | **75.826** |

## Appendix D: Research Data

| Year | GDP (ZAR bil) | Consumer price index (2010 = 100) | Mining GFCF (ZAR bil) | Ores and metals exports (% of merchandise exports) | Mining production and sales revenue (ZAR bil) | GVA (ZAR bil) |
|---|---|---|---|---|---|---|
| 2009 | 2 508 | 96,10 | 65 | 29% | 241 | 200,824 |
| 2010 | 2 748 | 100,00 | 64 | 28% | 300 | 230,35 |
| 2011 | 3 024 | 105,02 | 68 | 28% | 370 | 261,575 |
| 2012 | 3 254 | 111,03 | 72 | 25% | 364 | 267,344 |
| 2013 | 3 540 | 117,44 | 81 | 28% | 398 | 288,3 |
| 2014 | 3 805 | 124,65 | 86 | 24% | 396 | 287,488 |
| 2015 | 4 050 | 130,27 | 64 | 23% | 388 | 281,523 |
| 2016 | 4 359 | 138,86 | 54 | 22% | 438 | 317,724 |
| 2017 | 4 654 | 146,05 | 77 | 24% | 474 | 343,672 |
| 2018 | 4 874 | 152,63 | 54 | 25% | 499 | 369,62 |

## Appendix E: Normalised Research Data

| Year | Market capitalisation 2010 constant prices (ZAR bil) | Ores and metals exports (% of merchandise exports) | Mining production and sales revenue (% GDP) | JSE-listed companies' capital expenditure_2010 constant prices (ZAR bil) | Mining gross fixed capital formation (as a % of GDP) | Gross value add (% GDP) | Total mining and quarry capital expenditure_2010 constant prices (ZAR bil) |
|---|---|---|---|---|---|---|---|
| 2009 | 854,90 | 29,2 | 10% | 45 | 3% | 8% | 78 |
| 2010 | 1 032,30 | 28,2 | 11% | 44 | 2% | 8% | 83 |
| 2011 | 904,34 | 28,0 | 12% | 50 | 2% | 9% | 72 |
| 2012 | 755,47 | 25,2 | 11% | 54 | 2% | 8% | 72 |
| 2013 | 515,52 | 27,7 | 11% | 42 | 2% | 8% | 73 |
| 2014 | 484,83 | 24,1 | 10% | 35 | 2% | 8% | 71 |
| 2015 | 235,37 | 23,2 | 10% | 32 | 2% | 7% | 68 |
| 2016 | 334,22 | 22,4 | 10% | 25 | 1% | 7% | 58 |
| 2017 | 373,86 | 24,1 | 10% | 25 | 2% | 7% | 40 |
| 2018 | 370,59 | 25,03 | 10% | 29 | 1% | 8% | 50 |

## Appendix F: Correlation Analysis of Ores and Metals Exports as a Percentage of the Merchandise Trade

| Market capitalisation 2010 constant prices (ZAR bil) | Ores and metals exports (% of merchandise exports) | Rank market capitalisation | Rank ore and metal exports | Difference | **Difference** squared |
|---|---|---|---|---|---|
| 854,90 | 29,2% | 8 | 10 | -2 | 4 |
| 1032,30 | 28,2% | 10 | 9 | 1 | 1 |
| 904,34 | 28,0% | 9 | 8 | 1 | 1 |
| 755,47 | 25,2% | 7 | 6 | 1 | 1 |
| 515,52 | 27,7% | 6 | 7 | -1 | 1 |
| 484,83 | 24,1% | 5 | 4 | 1 | 1 |
| 235,37 | 23,2% | 1 | 2 | -1 | 1 |
| 334,22 | 22,4% | 2 | 1 | 1 | 1 |
| 373,86 | 24,1% | 4 | 3 | 1 | 1 |
| 370,59 | 25,0% | 3 | 5 | -2 | 4 |
| | | | | SUM | 16,000 |
| | | | | N | 10,000 |
| | | | | SRCC (r) | 0,903 |
| | | | | T Statistics | 5,946 |
| | | | | DF | 8,000 |
| | | | | p value (1 tail) | 0,00017 |
| | | | | p value (2 tail) | 0,00034 |

## Appendix G: Correlation Analysis of Mining Production and Sales Revenue

| Market capitalisation 2010 constant prices (ZAR bil) | Mining production and sales revenue (% GDP) | Rank market capitalisation | Rank production and sales revenue | Difference | Difference squared |
|---|---|---|---|---|---|
| 854,90 | 9,6% | 8 | 2 | 6 | 36 |
| 1032,30 | 10,9% | 10 | 7 | 3 | 9 |
| 904,34 | 12,2% | 9 | 10 | -1 | 1 |
| 755,47 | 11,2% | 7 | 8 | -1 | 1 |
| 515,52 | 11,2% | 6 | 9 | -3 | 9 |
| 484,83 | 10,4% | 5 | 6 | -1 | 1 |
| 235,37 | 9,6% | 1 | 1 | 0 | 0 |
| 334,22 | 10,0% | 2 | 3 | -1 | 1 |
| 373,86 | 10,2% | 4 | 4 | 0 | 0 |
| 370,59 | 10,2% | 3 | 5 | -2 | 4 |
| | | | | SUM | 62,000 |
| | | | | N | 10,000 |
| | | | | SRCC (r) | 0,624 |
| | | | | T Statistics | 2,260 |
| | | | | DF | 8,000 |
| | | | | p value (1 tail) | 0,027 |
| | | | | p value (2 tail) | 0,054 |

## Appendix H: Correlation Analysis of Capital Expenditure of JSE-Listed Companies

| Market capitalisation 2010 constant prices (ZAR bil) | JSE-listed companies' capital expenditure 2010 constant prices (ZAR bil) | Rank market capitalisation | Rank JSE-listed companies' capital expenditure | Difference | Difference squared |
|---|---|---|---|---|---|
| 854,90 | 45 | 8 | 8 | 0 | 0 |
| 1 032,30 | 44 | 10 | 7 | 3 | 9 |
| 904,34 | 50 | 9 | 9 | 0 | 0 |
| 755,47 | 54 | 7 | 10 | -3 | 9 |
| 515,52 | 42 | 6 | 6 | 0 | 0 |
| 484,83 | 35 | 5 | 5 | 0 | 0 |
| 235,37 | 32 | 1 | 4 | -3 | 9 |
| 334,22 | 25 | 2 | 1 | 1 | 1 |
| 373,86 | 25 | 4 | 2 | 2 | 4 |
| 370,59 | 29 | 3 | 3 | 0 | 0 |
| | | | | SUM | 32,000 |
| | | | | N | 10,000 |
| | | | | SRCC (r) | 0,806 |
| | | | | T Statistics | 3,852 |
| | | | | DF | 8,000 |
| | | | | p value (1 tail) | 0,0024 |
| | | | | p value (2 tail) | 0,0049 |

## Appendix I: Correlation Analysis of Total Mining and Quarrying Capital Expenditure

| Market capitalisation 2010 constant prices (ZAR bil) | Total mining and quarrying capital expenditure_2010 constant prices (ZAR billion) | Rank market capitalisation | Rank total mining and quarrying capital expenditure | Difference | Difference squared |
|---|---|---|---|---|---|
| 854,90 | 78 | 8 | 9 | -1 | 1 |
| 1 032,30 | 83 | 10 | 10 | 0 | 0 |
| 904,34 | 72 | 9 | 7 | 2 | 4 |
| 755,47 | 72 | 7 | 6 | 1 | 1 |
| 515,52 | 73 | 6 | 8 | -2 | 4 |
| 484,83 | 71 | 5 | 5 | 0 | 0 |
| 235,37 | 68 | 1 | 4 | -3 | 9 |
| 334,22 | 58 | 2 | 3 | -1 | 1 |
| 373,86 | 40 | 4 | 1 | 3 | 9 |
| 370,59 | 50 | 3 | 2 | 1 | 1 |

| | |
|---|---|
| SUM | 30,000 |
| N | 10,000 |
| SRCC (r) | 0,818 |
| T Statistics | 4,025 |
| DF | 8,000 |
| p value (1 tail) | 0,0019 |
| p value (2 tail) | 0,0038 |

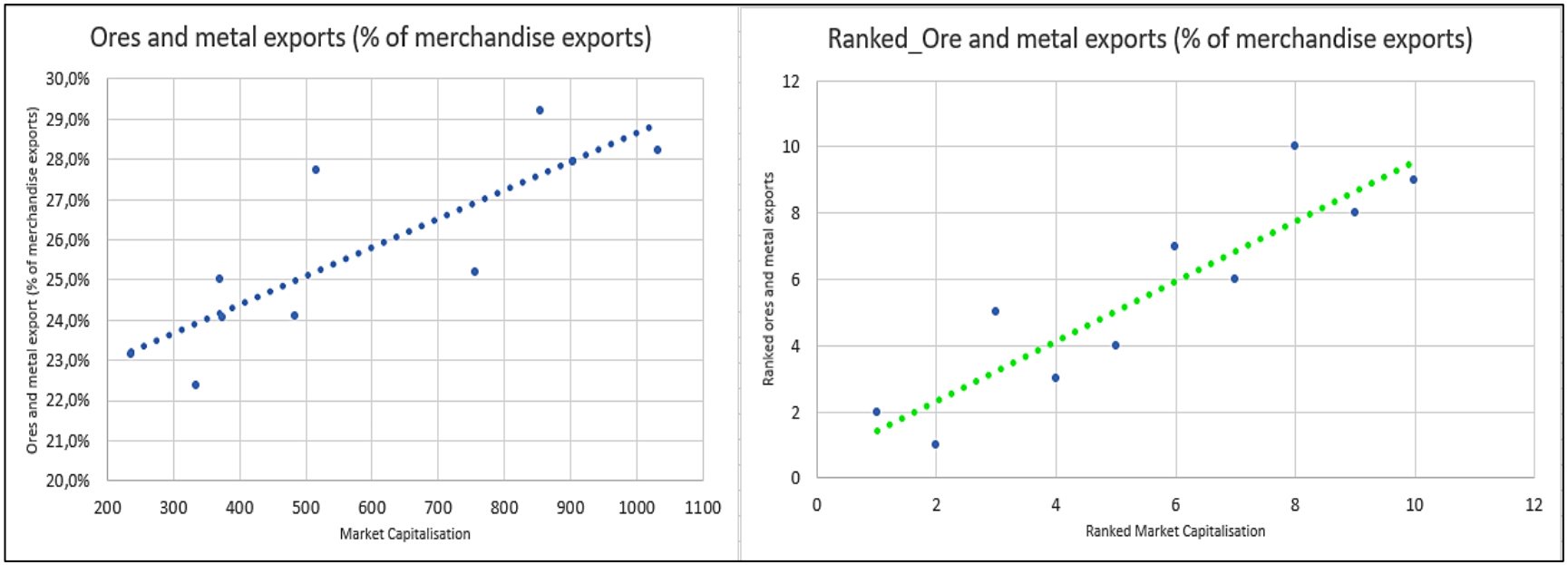
## Appendix J: Correlation Analysis of Gross Fixed Capital Formation

| Market capitalisation 2010 constant prices (ZAR bil) | Mining gross fixed capital formation (as a % GDP) | Rank market capitalisation | Rank mining gross fixed capital formation | Difference | Difference squared |
|---|---|---|---|---|---|
| 854,90 | 2,58% | 8 | 10 | -2 | 4 |
| 1 032,30 | 2,31% | 10 | 9 | 1 | 1 |
| 904,34 | 2,26% | 9 | 7 | 2 | 4 |
| 755,47 | 2,22% | 7 | 5 | 2 | 4 |
| 515,52 | 2,28% | 6 | 8 | -2 | 4 |
| 484,83 | 2,25% | 5 | 6 | -1 | 1 |
| 235,37 | 1,58% | 1 | 3 | -2 | 4 |
| 334,22 | 1,24% | 2 | 2 | 0 | 0 |
| 373,86 | 1,66% | 4 | 4 | 0 | 0 |
| 370,59 | 1,11% | 3 | 1 | 2 | 4 |
| | | | | SUM | 26,000 |
| | | | | N | 10,000 |
| | | | | SRCC (r) | 0,842 |
| | | | | T Statistics | 4,422 |
| | | | | DF | 8,000 |
| | | | | p value (1 tail) | 0,0011 |
| | | | | p value (2 tail) | 0,0022 |

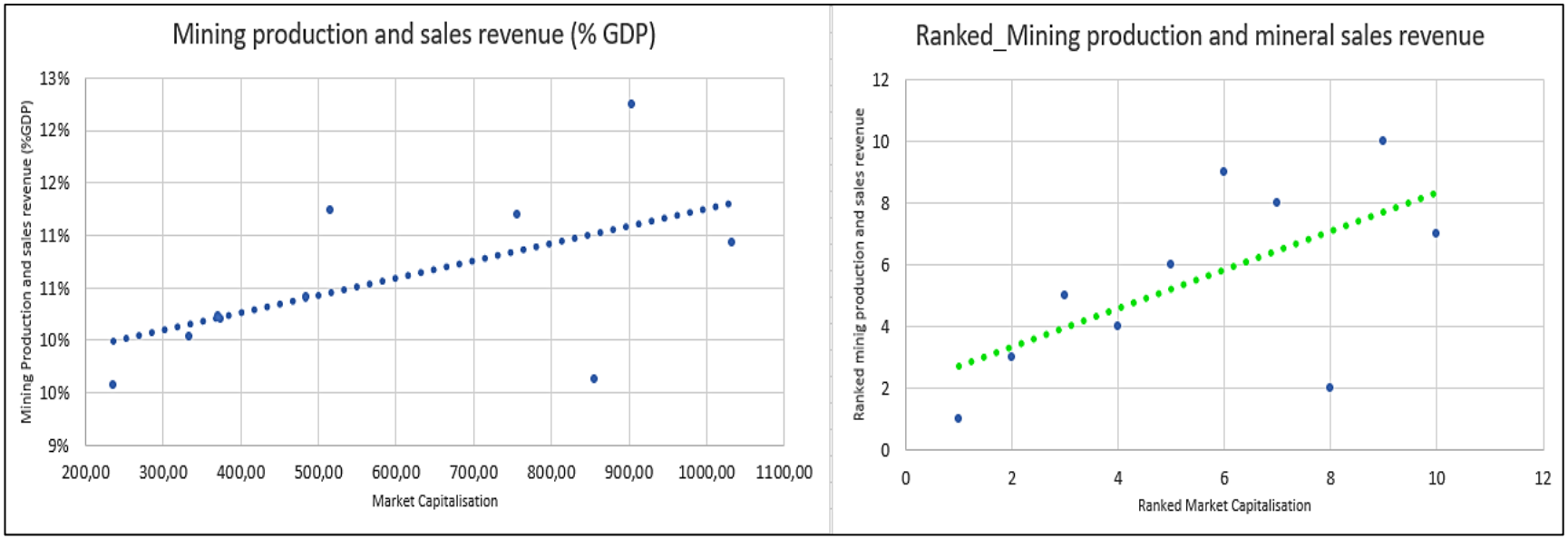
## Appendix K: Correlation Analysis of Gross Value Add

| Market capitalisation 2010 constant prices (ZAR bil) | Gross value add (% GDP) | Rank market capitalisation | Rank gross value add | Difference | Difference squared |
|---|---|---|---|---|---|
| 854,90 | 8,01% | 8 | 6 | 2 | 4 |
| 1 032,30 | 8,38% | 10 | 9 | 1 | 1 |
| 904,34 | 8,65% | 9 | 10 | -1 | 1 |
| 755,47 | 8,22% | 7 | 8 | -1 | 1 |
| 515,52 | 8,14% | 6 | 7 | -1 | 1 |
| 484,83 | 7,55% | 5 | 4 | 1 | 1 |
| 235,37 | 6,95% | 1 | 1 | 0 | 0 |
| 334,22 | 7,29% | 2 | 2 | 0 | 0 |
| 373,86 | 7,39% | 4 | 3 | 1 | 1 |
| 370,59 | 7,58% | 3 | 5 | -2 | 4 |
| | | | | SUM | 14,000 |
| | | | | N | 10,000 |
| | | | | SRCC (r) | 0,915 |
| | | | | T Statistics | 6,421 |
| | | | | DF | 8,000 |
| | | | | p value (1 tail) | 0,00010 |
| | | | | p value (2 tail) | 0,00020 |

## Appendix L: Scatterplots for Ores and Metal Exports as a Percentage of Merchandise Trade



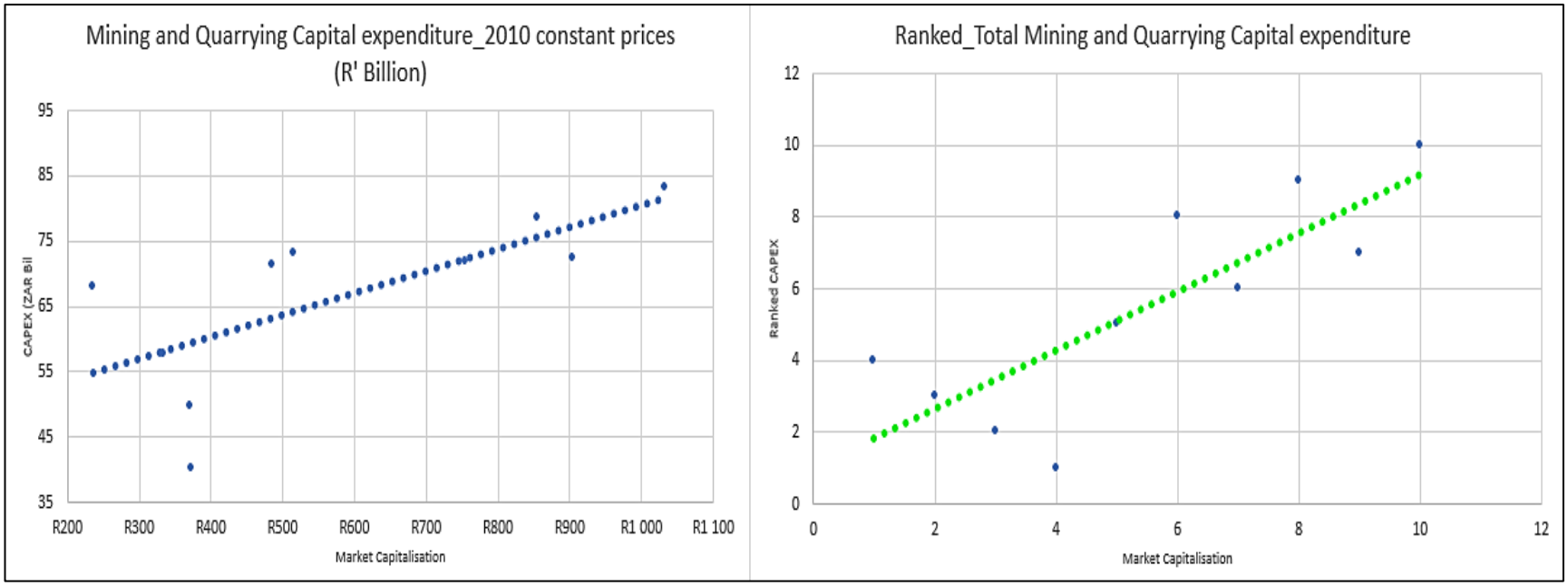
## Appendix M: Scatterplots for Mining and Production and Sales Revenue as a Percentage of GDP



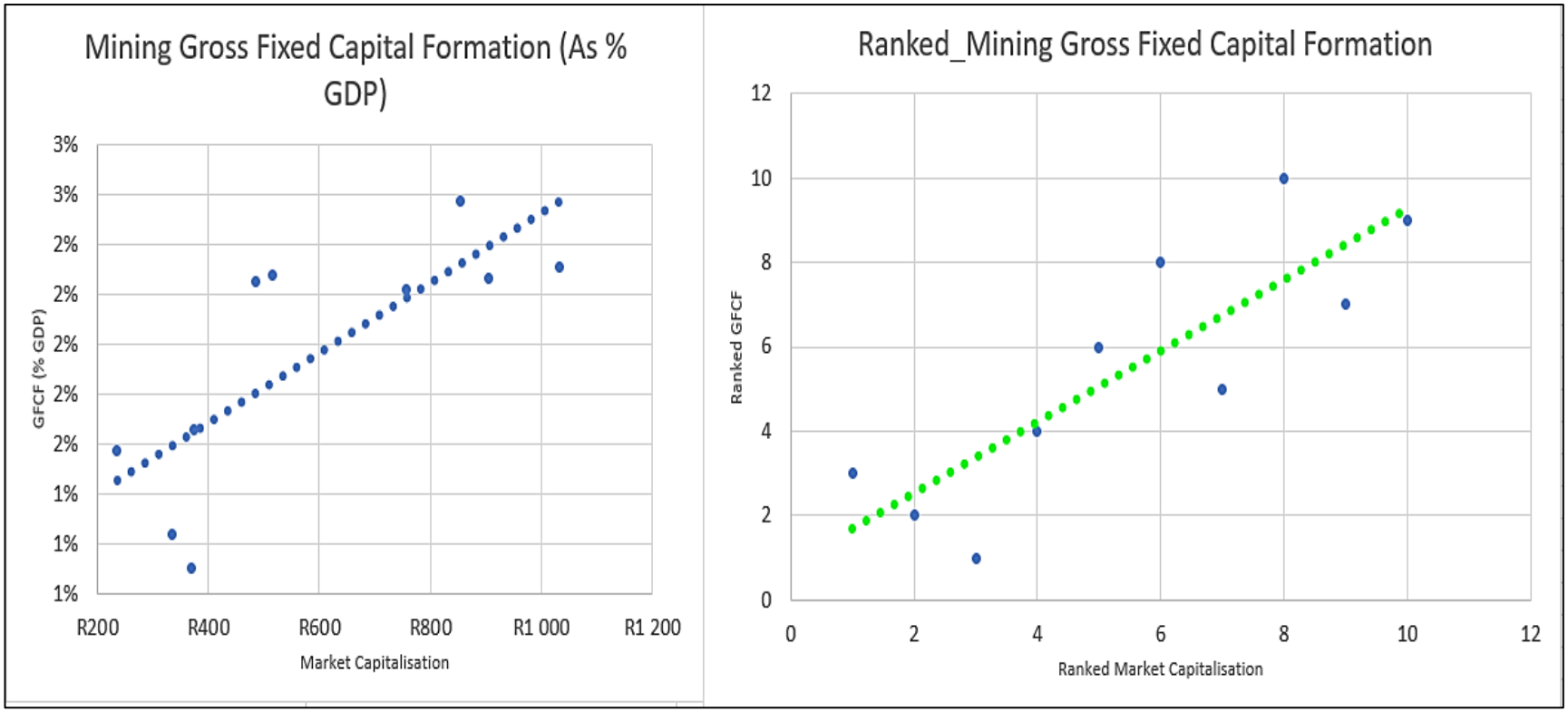
## Appendix N: Scatterplots for JSE-listed Mining Companies Capital Expenditure



## Appendix O: Scatterplots for Total Mining and Quarrying Capital Expenditure



**Appendix P: Scatterplots for mining Gross Fixed Capital Formation**



## Appendix Q: Scatterplots for Gross Value Add

