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An Empirical Analysis of Competition and Efficiency in The Medical Scheme Market in South Africa

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PLAGIARISM DECLARATION

I, Chido Fungai Dzinotyiwei, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I authorise the University to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

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To God, With You Nothing is Impossible. May You Receive All the Glory.

ABSTRACT

In South Africa, pre-funded healthcare products are dominated by medical schemes and this market segment is regulated by the Council for Medical Schemes (CMS) which abides by the Medical Schemes Act (MSA) (FinMark Trust, 2016). The aim of this study is to empirically evaluate the relationship between efficiency and competition in the medical scheme industry in South Africa from 2011 to 2021. In the medical scheme market, there are two types of medical schemes available: open medical schemes and closed or restricted medical schemes. Open medical schemes are available to anybody who chooses to enrol, while restricted medical schemes are only accessible to members of specific groups or entities, such as individual businesses, industries, or unions (Council for Medical Schemes [CMS], 2021). This study conducts an empirical evaluation of efficiency and competition in South African medical schemes from 2011 to 2021, specifically differentiating between open and restricted schemes.

The research utilises an ordinary least squares regression model on panel data to find that closed medical schemes have greater efficiency at 98% than open medical schemes at 96.7%. Based on the Random Effects model output, the regression finds that there is a significant impact of competition (negative) and size of memberships (positive) in explaining some variation in the medical scheme industry, however the variables tested explained 40% of the variation in the regression. The findings reveal a complex situation in the market, marked by strong effectiveness, moderate market dominance, varied financial strategies and stable membership levels among closed medical schemes.

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LIST OF ABBREVIATIONS

CMS	Council for Medical Schemes
CPI	Consumer Price Index
DEA	Data Envelopment Analysis
DMU	Decision-making Unit
GCR	Global Credit Rating
GEMS	Government Employees Medical Scheme
HCCI	Healthcare Cost Inflation
HHI	Herfindahl Hirschman Index (hhi)
HMO	Health Maintenance Organization
LTIA	Long-term Insurance Act
MSA	Medical Schemes Act
NHI	National Health Insurance
PMB	Prescribed Set of Minimum Benefits
QLH	Quiet Life Hypothesis
SFA	Stochastic Frontier Analysis
STIA	Short-term Insurance Act
TBRT	Truncated Bootstrapping Regression Technique
U.S.	United States of America
FE	Fixed Effects
RE	Random Effects

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The industry for financial services is growing in emerging markets, particularly those in Sub-Saharan Africa. Various products are currently offered and innovated through various institutional vehicles such as corporate firms and start-ups to meet the needs of economic participants (FinMark Trust, 2016).. Although the contribution of the insurance sector in Africa has increased twofold from 1995 to 2015, it has not yet met the global demand averages (Swiss Re, 2015). In South Africa, these growth prospects are privy to the complicated system which functions through fragmented risk pools that are governed by separate regulatory regimes for health insurance and medical schemes (FinMark Trust, 2016).

In South Africa, medical schemes dominate the market for pre-funded healthcare products and this market segment is regulated by the Council for Medical Schemes (CMS) which abides by the Medical Schemes Act (MSA) (FinMark Trust, 2016). The market provides a prescribed set of minimum benefits (PMB) to members who reside in one of the two structures of the medical scheme funds: (i) the funds can operate as open funds that accept membership from individuals who can afford the premiums (ii) the funds can operate in a manner that restricts their access to a particular group or employer. Medical schemes service an estimated 8 million people representing approximately 16% of the market (FinMark Trust, 2016). The composition of medical schemes has become one of many indicators of structural inequity in the country as comprehensive plans are offered to individuals with higher incomes and those with lower income levels compromise access to added medical services for more affordable plans. The majority of South Africans are not covered by pre-funded products and thus incur out-of-pocket medical expenses and develop a heavy reliance on public health institutions.

The element of competition has become an increasingly influential aspect in the dominant dynamics of the medical scheme market in South Africa. In 2000, South Africa had 140 registered medical schemes and this number decreased to 79 by 2018 comprising 58 restricted schemes and 21 open schemes (Rama and McLeod, 2001). The Council for Medical Schemes (CMS) report in 2018 states that a pronounced decline in medical schemes occurred between 2008 and 2010 when the industry experienced mergers, deregistration and liquidations which saw almost 20 schemes exit the market within that two-year period. In this case, the process of a merger is considered as

an act of improving firm efficiency in a market whereas deregistration and liquidation is a sign of discarding inefficient entities due to market conditions in South Africa's free market economy. The decreasing number of medical schemes is also attributed to the success of efficient schemes with profits that sustain their operations, although the medical schemes are intended to be not-for-profit entities. Figure 1 illustrates the changes in the number of medical schemes from 2000 to 2018 compartmentalized by scheme type.

Figure 1 : Number of Medical Schemes in South Africa 2000 - 2018

Source: Extracts from Council of Medical Schemes Annual Report (2018/19)

Various socio-economic conditions – such as the growing population and health-related challenges – are driving the rising demand of pre-funded health financing in South Africa. The government has committed itself to a 14-year implementation plan for National Health Insurance (NHI) – an initiative driving health system reform to accomplish increased equity and quality in the public health sector. Though an NHI workstream has been tasked with establishing the role of medical schemes through the programmes, the current NHI bill conveys that once the system is "fully implemented", medical schemes will be unable to provide cover for medical services that are funded by the NHI (NHI Bill, 2019).

The socioeconomic environment, current market dynamics as well as the implementation of the

NHI and updated regulation, forms the basis of this paper which will study the empirical relationship between efficiency and competition in the medical scheme market in South Africa from 2011 to 2021.

1.2 Problem Statement

The medical scheme market in South Africa is characterized by high levels of market concentration, which may deter competition and therefore limit the service provider options available to consumers. The lack of empirical research on the relationship between market concentration and efficiency in the medical scheme market in South Africa creates a significant knowledge gap which validates the purpose of this paper. Therefore, this study seeks to provide an empirical analysis of competition and efficiency in the medical scheme market in South Africa. This research is critical in providing policymakers with valuable insights into the necessary interventions to improve market efficiency and promote competition in the South African medical scheme market.

The problem areas that this paper seeks to address are summarized below;

* ***There is a case to understand medical scheme efficiency in South Africa***

  Medical schemes serve millions of people in South Africa and their state of affairs are of importance in understanding the overall healthcare market and their ability to efficiently meet the needs of beneficiaries.

* ***There is a need to understand the relation between competition and efficiency in the market given its current dynamics***

  This relationship is vital in providing an understanding of the market dynamics in the medical scheme industry and how they contribute to the performance of open and restricted schemes.

* ***Previous studies in this area of study contain limitations***

  The limitations evident in previous literature include a limited analysis on the impact of competition on efficiency. This will be accommodated through the research methods employed in this study.

1.3 Limitations of Existing Research

The existing literature on the efficiency and competition in healthcare markets, particularly in medical schemes, presents several limitations. One major issue is the inconsistency in methodology across studies, which complicates the comparison of results. For instance, Alhassan et al. (2023) and Alhassan, Addisson, and Asamoah (2015) use data envelopment analysis (DEA) to evaluate efficiency, whereas studies like Alhassan and Biekpe (2016) and Barros and Wanke (2014) employ stochastic frontier analysis (SFA), leading to varying conclusions about the efficiency of healthcare providers. In addition, many studies, such as those by Clemente et al. (2018) and Nguyen and Worthington (2020), focus on developed markets, limiting their applicability to developing countries like South Africa, where structural and regulatory differences significantly influence the outcomes and results. Eling and Luhnen (2010) attempt a broader comparison of healthcare systems, but their emphasis on high-income nations leaves gaps in understanding emerging markets particularly those in Africa. McCue and Hall (2014) and Yang and Wen (2017) highlight competition's impact on financial sustainability but fall short in addressing the unique dynamics of restricted versus open schemes, a distinction emphasized in markets like South Africa. Additionally, Ndlovu (2021) points to the need for more granular data on scheme-level competition, an area that remains underexplored despite its relevance in identifying inefficiencies in this area. The literature does provide valuable insights whose contribution to the study area have been instrumental; however, collectively, these limitations suggest that a more standardised approach and greater focus on emerging markets are necessary to fully understand the complex interplay between efficiency and competition in medical schemes.

1.4 Purpose and Significance of Research

Medical schemes have existed in South Africa for over 50 years, yet the literature on their characteristics is not as broad as that in the developed world where most studies on this topic have been conducted. It is essential to gain an understanding of the factors that affect efficiency in the medical scheme market as this has the potential to feed into the financial performance of these firms and their long-term sustainability. This study will contribute to the body of knowledge on medical schemes in South Africa and will develop a greater understanding of how competition and efficiency affects the medical scheme market as well as the factors that affect the efficiency of this

market in South Africa.

1.5 Research Questions

The following research questions have been designed to respond to the knowledge gap identified above. These questions are aligned to the problem statement, research objectives and the purpose of the study.

a) Does competition affect the efficiency of medical schemes in South Africa?

b) What are the prominent factors that affect medical scheme efficiency in South Africa?

1.6 Research Objectives

This study seeks to review, evaluate, and provide an empirical analysis of competition and efficiency in the medical scheme market in South Africa. Therefore, the main objective of this study is detailed below:

a. To examine the relationship between competition and medical scheme efficiency.

b. To examine the other determinants of medical scheme efficiency in South Africa.

1.7 Organisation of the study

The organisation of the study will be conducted as follows:

Chapter 1 of this study presented the background of the study and introduced the problem statement, research objectives and hypotheses and justification for the study.

Chapter 2 presents a summary and critical synthesis of the literature and relevant research associated with health insurance, medial schemes, the South African market and financial performance measures.

Chapter 3 presents the methodology and procedures used for data collection and analysis. Chapter 4 contains an analysis of the data and presentation of the results.

Chapter 5 offers a conclusive summary and discussion of the study's findings, policy recommendations and recommendations for future research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The South African health insurance market offers several health funding products to cater to the varying income tiers in the society. The broad categories of products are top-up insurance cost-based insurance and cash-based insurance. Medical schemes function as not-for-profit trust funds and insurance policies function as for-profit offerings. This paper will focus on the dynamics and financial performance of medical schemes.

2.2 Conceptualization and Definitions

2.2.1 Medical Schemes

A registered scheme is a medical scheme that reports to the Office of the Registrar in order to comply with the Medical Schemes Act (MSA) (Rama and McLeod, 2001). These registered schemes are governed by the Council for Medical Schemes (CMS) which is a statutory body established by the MSA to serve the interests of the public and of medical scheme members and beneficiaries (CMS, 2021). In South Africa, there are two types of registered schemes – open schemes and restricted schemes.

1.8 Open Schemes

An open scheme is a medical scheme whose membership is open to any individual who makes an application and can afford the periodic contribution. The majority of open schemes are large in number of beneficiaries, defined by Rama and McLeod (2001) as a scheme with more than 30 000 beneficiaries. The risk pool for open schemes is often more variable and its administration costs are generally high.

1.9 Restricted Schemes

A restricted scheme is a medical scheme that confines membership based on one or two classifying traits such as employment, professional association, union or industry. The majority of restricted schemes are small in number of beneficiaries, defined by Rama and McLeod (2001) as a scheme with less than 6 000 members. The risk pool for restricted schemes is often less volatile and more predictable given the similar traits of its members. The administration costs are generally lower

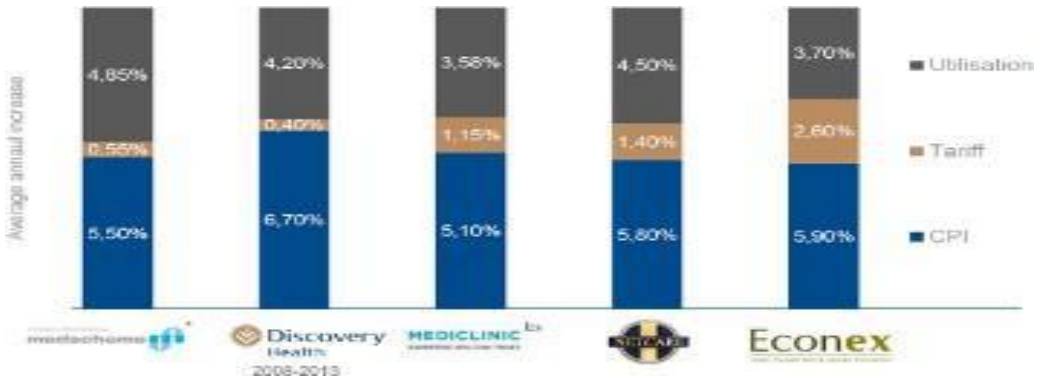
than those of open schemes.

1.10 Competition

Medical schemes are operated as not-for-profit entities in the form of trusts (CMS, 2021). Therefore, the medical scheme regulatory market incentivises competition because of risk profile as opposed to competition on the basis of efficiency (FinMark Trust, 2016). This is because of the market operating under partial social solidarity which causes fragmentation in the risk pool. The price of each medical scheme benefit option is heavily influenced by its community rating and the risk profile of the beneficiaries of that option (Kaplan and Ranchod, 2012). The fact that pricing is dependent on risk profile means that medical schemes do not need to compete based on purchasing healthcare in a more efficient manner.

The cost of pre-funded healthcare cover increased to rates above Consumer Price Index (CPI) and this impacted the cost of medical schemes. These increases were largely attributed to escalating claims costs referred to as Healthcare Cost Inflation (HCCI) (FinMark Trust, 2016). HCCI is normally greater than CPI due to tariff increases, the specialised nature of services, innovation and salary increases in the medical scheme industry (FinMark Trust, 2016). There is an increase in utilisation, which is the rate at which consumers use healthcare services (FinMark Trust, 2016). Figure 2 highlights the primary cost drivers identified by the Competition Commission Private Healthcare Market Enquiry.

Figure 2: Cost Drivers in the Medical Scheme Industry



Source: Summary of Data received by the Competition Commission (FinMark Trust, 2016)

2.3 The Medical Scheme Market in South Africa

2.3.1 History

A significant and largely comprehensive form of medical cover was first introduced in the United States of America in the 1950s and in South Africa, it was introduced in the mid-1980s as hospital cash products aimed at providing financial relief for healthcare expenses (McCue and Hall, 2014). By 1989 there were approximately 50 000 policies as the market for these products linked to a disability income product grew through direct marketing through mail and advertisements (FinMark Trust, 2016). By 1991, a minimum of 13 insurers in South Africa were marketing either a Hospital Cash plan product or a medical policy – products which were a hybrid of the traditional definitions of short-term or life insurance products (Rama and McLeod, 2001). In 1996, legislative changes to policy were in effect to accommodate the rising need and prevalence of these hybrid products. The Department of Health released a draft document supporting the need for a single legislative framework for all healthcare products given the findings of the 1994 Melamet Commission (Rama and McLeod, 2001). At this juncture, the Short-term Insurance Act (STIA) and the Long-term Insurance Act (LTIA) were undergoing active revision. The LTIA defined medical schemes as funds under the category "life policy" to accommodate the re-insurance component of medical scheme benefits by life insurance funds (FinMark Trust, 2016). It was of vital importance that the manner in which medical schemes operate – by paying medical expenses to health service providers – would not be replicated through health policies thus a separate definition for a health policy was introduced in the revised LTIA and STIA documents (Rama and McLeod, 2001). The LTIA, STIA and the Medical Schemes Act were all promulgated in 1998.

2.3.2 Regulation and Types of Medical Schemes

Medical schemes are regulated by the Medical Schemes Act 131 of 1998. It is a requirement for these entities to be registered with the Council for Medical Schemes as well as to be governed by a board of trustees. A medical scheme cover entails that in exchange for a monthly premium, one obtains financial cover for medical treatment and any other related medical expenses such as optometry, surgery, doctor's visits and hospital accommodation to name a few (Council for Medical Schemes, 2021). Two types of medical schemes exist in the South African market – open and restricted schemes to which the latter are reserved for members of a particular industry,

association, or profession. The contributions of all medical scheme members are pooled to fund the claims of members. Any excess capital is transferred as reserves for the sole security and benefit of the contributing members which manages returns and ensures that the scheme does not become a profit-making entity. Individual medical schemes have unique rules which first abide by the regulation from the Medical Scheme Act. Firms of this nature are expected to provide equitable and fair treatment for all contributing members in line with their respective chosen benefit plan.

2.3.3 Financial Performance and Solvency

The current solvency requirements for medical schemes in South Africa is 25% of gross member contributions (Ramjee and Vieyra, 2014). In addition to this requirement which impacts financial performance, medical schemes are obligated to offer a package of Prescribed Minimum Benefits (PMBs) to protect members from being offered options that enable them to pick benefits that may not sufficiently cover potential needs should the need arise (Ramjee and Vieyra, 2014). Table2.1 illustrates the statement of comprehensive income of medical schemes in South Africa from 2011 to 2018. The figures show the consolidated figures which include both open and restricted schemes. The net claims incurred represent the healthcare related expenses. The non-healthcare expenses include net income or expenses on commercial reinsurance, brokers costs, administration expenditure and net impairment losses on trade and other receivables. The net healthcare result is the result of other investment income, finance costs and other expenditure. The other comprehensive income is calculated as adjustments on available-for-sale investments, reclassification adjustments as well as land and buildings revaluation.

Table 2. 1: Statement of Comprehensive Income of Medical Schemes in South Africa

All figures in R'000	2011	2014	2015	2018
Income				
Gross contr. income	107382943	140205740	151625524	192283208
Savings contr. income	(9821415)	(13275008)	(14880304)	(18328175)
Total (Net income)	97561528	126930732	136745220	173955033
Expenditure				
Net claims incurred	(84402546)	(111989918)	(124946688)	(156946525)
Non-Healthcare Exp	(12124681)	(15405326)	(13007002)	(15790454)

Net Healthcare Result	1034301	(464512)	(1208470)	1218054
Total	4290747	3409938	2543128	5021211
Other Comp. Income	(55213)	213603	(508668)	(404231)
Total Comp. Income	4235534	3623541	2034460	4616980

Source: Extracts from CMS Annual Report 2011 to 2018

The contribution of open schemes is greater than that of restricted schemes as there remained a greater proportion of the former throughout the period 2011 to 2018. An apparent observation is that the net income increases year-on-year, and this is mimicked by the increase in net claims incurred. During the period 2011 to 2018, the year 2017 generated the highest total comprehensive income due to the inflow from net healthcare result. This was a combined result of investment income and realised and unrealised gains amounting to approximately R5 947 300 000. The largest value of expenses was realised in 2016 due to the increase in net healthcare result driven by restricted schemes.

2.3.4 Key Market Insights and Challenges

The number of medical schemes in South Africa decreased from 144 in 2000 to 79 in 2018 mainly due to voluntary amalgamations which consolidate medical schemes. The 79 medical schemes registered in 2018 consisted of 21 open schemes and 58 restricted schemes (Council for Medical Schemes, 2019). In 2018 there was one medical scheme liquidation by Community Medical Aid Scheme (COMMED) and an amalgamation of University of Witwatersrand, Johannesburg Staff Medical Aid Fund with Discovery Health Medical Scheme on 1 January 2018 (Council for Medical Schemes, 2019).

To assess the financial stability of a medical scheme to settle claims, its Global Credit Rating (GCR) is assessed. Table 2.2 depicts the top seven medical aid schemes in South Africa and their GCR rating in 2018 in alphabetical order.

Table 2. 2:Top 7 firms in Medical Aid Scheme Market in South Africa

Medical Scheme Name	Scheme Type	GCR Rating
BestMed Medical Scheme	Open	AA+
Bonitas	Open	AA-
Discovery Health Medical Scheme	Open	AAA
Fedhealth	Open	AA-
Medihelp	Open	AA-
Medshield Medical Scheme	Open	AA-
Momentum	Open	AA

Source: Extracts from Council for Medical Schemes (2019)

As discussed above, the provision of pre-funded healthcare products is limited to the low-income market for a variety of reasons detailed below:

- Affordability

Medical schemes in South Africa are unaffordable for most of the population whose average monthly salary is R6 000 per household where the comprehensive benefits of medical schemes are unlocked at premiums accessible to those who earn more than approximately R15 000 per month per household (Statistics South Africa [StatsSA], 2018). FinMark (2016) and McCue, (2017) are studies which have shown that there is a strong relationship between income levels and medical scheme coverage, and which implies that solving its unaffordability would contribute to the increase of coverage for South Africans. The main factors that influence the unaffordable nature of medical schemes to low-income individuals include the cost of anti-selection, the higher cost of the open scheme model and the high-cost base of the required cost package for PMB.

- Market Fragmentation

Health insurance products provide little solidarity given the community-based nature of South African society. The fragmentation of the market from the broader industry level to the individual product structures creates a barrier to entry for clients who then fail to meet the standards of the risk-rated offerings.

- Cost Inflation

Healthcare Cost Inflation (HCCI) has been prevalent in the medical scheme industry in addition to standard economic inflation. This is propelled by increases in consumer demand as the market expands as well as non-healthcare costs and regulation tariffs. The increase in non-healthcare costs is driven by the need to increase risk-management and cost-containment to address the frequent and constant threats to stability in the medical scheme market.

2.4 Industry Stakeholders

This section of the paper discusses the types of industry stakeholders in the medical scheme industry as well as their influence on the strategic and commercial direction of the products in the market which steers the performance of medical schemes. The discussion below on employers in the economy, third-party providers and financial services firms will be explored.

2.4.1 Employers

Employers in the economy drive demand for medical schemes and enable affordability of these healthcare financing products through package subsidies on the cost of the cover. Large employers can function as large purchasers of healthcare services for their employees thereby influencing the performance of medical schemes in the economy (FinMark Trust, 2016). Employers are increasingly adopting the notion that they must be subscribed to a medical scheme as a condition of service which makes membership mandatory for a portion of the labour force thereby reducing the threat of anti-selection in the market. The growing trend that is seeing fewer people staying with a single employer over the course of their whole careers has resulted in an observation that a proportion of medical scheme beneficiaries opt for open schemes to meet the condition of service requirement.

The benefit-design and cost of cover for both pre- and post-retirement health cover is a factor that employers prefer to control in order to manage the liabilities associated with medical scheme subsidies provided to employees. Some employers opt for restricted medical schemes which are established in-house to cater to the preference of reduced costs. This model has proven to be beneficial for large and well-organised employers with capacity to maximise on economies of scale and cost minimisation for the spectrum of income earners in the organisation. The diverse

range of specified needs among employers enhances the healthcare financing products on offer thus enhancing the scope of the market. The needs of mining conglomerates and occupational health practitioners feed into the research, development and deployment of nuanced products that contribute to the financial performance of overall medical scheme providers (van den Heever, 2012).

2.4.2 Third-party Service Providers

The not-for-profit medical scheme market includes parties that offer for-profit services such as third-party service providers who provide additional services to the medical schemes. These third-party operators provide services such as administration, consulting, marketing, and advisory services which form part of the day-to-day needs of medical schemes. The market for these services consists of oligopolistic participants as it has become concentrated in South Africa over time (FinMark Trust, 2016). In order to maintain the not-for-profit ethos of medical schemes amidst the interactions with for-profit third-parties, the MSA mandates various clauses to clearly ensure that there is separation between the medical scheme funds and the service providers. The CMS regulator has strengthened governance and compliance in the medical scheme industry as well as monitoring the costs attributed to non-healthcare costs to limit the withdrawal of profits from schemes (FinMark Trust, 2016). Van den Heever (2012) distinguishes strong medical schemes as those that require service providers to bid for contracts as opposed to securing long-term contracts based on relationships within the market. The Government Employees Medical Scheme (GEMS) is considered a strong scheme in this regard as all outsourced services are secured through a tender process which secures business for a period of three years, and it divides administrative and managed care services between different third-party service providers. The market for third-party service providers has become increasingly concentrated from a 49% market share among the top three administrators in 2012 to an 80% market share for these players in 2014 due to market withdrawals and amalgamations due to the competitive nature of the highly regularised industry (FinMark Trust, 2016). The market for medical scheme administration is dominated by Discovery Health, Medscheme and MMI Holdings. There exist schemes that opt to internally retain the costs of third-party services which are then paid directly from the profits of the scheme. However, self-administration growth opportunities are limited due to the not-for-profit

nature of medical schemes.

2.4.3 Financial Services Companies

Large financial services institutions explored and started offering pre-funded healthcare financing to the market as the commercial opportunity arose following the relaxation of the medical scheme regulation in the 1990s. The socioeconomic aspect of this market presents challenging dynamics which has required financial institutions to either innovate and provide new schemes to the market or to take over the administration, underwriting and distribution of existing schemes as a business model. The distribution of medical scheme products is vital to ensure the success of the business as there are numerous competitors whose main aim is to capture the market for which demand is growing but not at the desired pace. The complexity of the pre-funded health products market has seen large corporate firms exit and re-enter the market in a bid to capitalise on the opportunity. These firms include Old Mutual and Liberty. Old Mutual has a restricted scheme registered as the Old Mutual Staff Medical Aid Fund.

2.5 Medical Scheme Product Offerings

2.5.1 Low-cost Open and Restricted Schemes

Open funds tend to be larger and more expensive than restricted scheme options. There is significant competition among open schemes which leads to diverse product offerings that are geared to capturing various income-related tiers of the market. The section below on top-up cover is predominantly applicable to non-low- income market as the pre-requisite of medical scheme membership excludes this group from the supplementary benefits offered in top-up cover products.

2.5.2 Top-Up Cover

Top-up insurance product require a medical scheme membership as a prerequisite prior to taking up the cover which provides additional benefits. The product offerings include:

i. Medical Scheme Shortfall Cover

These products offer targeted benefits for individual shortfalls for open scheme members although they may be targeted at restricted schemes when treated for that market. Shortfall cover products do not have direct links to healthcare providers, and they demand an additional premium.

ii. Gap Cover

Gap cover is available independent of the subscribed medical scheme option taken by the consumer. Benefits to gap cover products such as CT scans, mammograms and X-rays have an overall annual limit.

2.5.3 Growth Potential of Medical Schemes

Medical schemes are predominantly vehicles with a board appointed by the members of the scheme thereby excluding them from having shareholders. This leads to a conservative and targeted board strategy aimed at optimising the interests of the members which differs from a purely for-profit enterprise. Actions for medical schemes become incentivised by sustainability rather than growth, and market share maximisation to meet the membership community's guidelines and standards, as well as to attract new members from the suitable financial profile for the purposes of continuity. In the case of medical schemes, attracting the appropriate client produces greater sustainability and efficiency than pursuing for-profit metrics such as profit maximisation and cost reduction (Ramjee and Vieyra, 2014). In addition to the non-profit and growth limiting nature of medical schemes, PMBs account for approximately 60% of a medical scheme's actuarial liability, thereby limiting a scheme's ability to meet market-driven needs and to offer many profit-making market segmentation products (Ramjee and Vieyra, 2014).

2.6 The Quiet Life Hypothesis: the relationship between competition and efficiency

The relationship between competition and efficiency is related in the literature and explains the relationship between market structure and performance. Erasmus and Theron (2016) explain that firms in markets with higher market concentration can earn additional profits due to collusive behaviour between the firms in the industry. This hypothesis postulates that a positive relationship between concentration and performance exists, thereby inferring that the higher the market concentration then the higher the firm's market power, which secures its superior performance Erasmus and Theron (2016). In the context of this study, the quiet life hypothesis (QLH) focuses on the effect of competition - market power - on efficiency by postulating that the higher the higher the market power, the lower the effort required to maximise efficiency, which implies a negative correlation between market power and entity efficiency (Hicks, 1935).

The hypothesis that higher levels of market power result in lower efficiency can be justified by several reasons. Baros and Wanke (2014) detailed these through the lens of managers as the entities with a behavioural incentive to perform efficiently. First, if firms can charge prices in excess of competitive levels due to their market power, then managers are not incentivized to work in order to manage costs thereby living a “quiet life” devoid of their active contribution to managing cost-related business activities (Baros and Wanke, 2014). Second, market power avails other opportunities to manager thereby enticing them to pursue objectives other than revenue/profit maximisation. Third, in a non-competitive industry, managers dedicate resources to obtaining and maintaining market dominance which is done by raising costs and reducing cost efficiency. Finally, sustained market power enables the behaviour of inefficient managers to persist without any intention to pursue profit-maximising goals in an efficient manner (Baros and Wanke, 2014)..

Studies advocating for alternative explanations and rejecting the QLH exist in the literature that focuses on the banking industry. The justification is due to the characteristics of banks: an important one being that they can reduce problems inherent to their existence such as asymmetric information and issues of moral hazard and adverse selection by establishing and nurturing long-term relationships with clients (Rama and McLeod, 2001). This is a common trait shared by medical schemes whereby their propensity to tend to long-term relationships enables them to understand their clients in a meaningful manner that can contribute to achieving firm efficiency.

2.7 Life Insurance and Non-Life Insurance

Life and non-life insurance segments are critical components of the broader insurance industry. Life insurance provides financial protection to beneficiaries in the event of the policyholder's death, offering products like term life and whole life insurance. In contrast, non-life insurance, often referred to as general insurance, covers risks other than death, such as property, liability, and health insurance, including motor and home insurance (Zinyoro and Aziakpono, 2024). Both segments have distinct dynamics, particularly in emerging markets like South Africa, where regulatory frameworks, market concentration and socio-economic factors shape the performance of insurance providers.

In South Africa, life insurance plays a significant role in long-term savings and financial security, especially given the country's socio-economic disparities. The life insurance market is highly

concentrated, with a few large players dominating the landscape, which affects competition and efficiency (Msomi and Nyide, 2021). Efficiency studies in the life insurance sector, such as those by Ige-Gbadeyan and Swanepoel (2023) and Abdulraheem-Saheed (2022), have utilised data envelopment analysis (DEA) and stochastic frontier analysis (SFA) to assess the performance of insurers. These studies suggest that large insurers tend to benefit from economies of scale, but smaller insurers may struggle to achieve optimal efficiency due to high operational costs and regulatory burdens. When it comes to efficiency, studies of the life insurance sector in South Africa, such as Alhassan and Biekpe (2016), indicate a high degree of competition, especially among large providers, leading to efficiency improvements over time. Using data envelopment analysis (DEA), they found that life insurers in South Africa exhibited strong cost efficiency, though smaller firms struggled to compete with dominant players. This finding is consistent with Eling and Luhnen (2010), who used stochastic frontier analysis (SFA) to assess global life insurance markets and identified similar patterns of efficiency, where competition drives cost-reduction efforts.

Non-life insurance in South Africa has a different dynamic, with higher market fragmentation compared to life insurance. This sector is marked by competition among numerous small and medium-sized players, especially in motor and property insurance (Alhassan and Boakye, 2020). Studies like those by Ige-Gbadeyan (2023) and Zinyoro and Aziakpono (2024) have focused on efficiency within the non-life insurance sector, emphasizing the importance of financial stability and claims management. For the non-life insurance segment, the literature reveals more volatility due to the wider range of risks covered. Barros and Wanke (2014), who applied DEA to evaluate efficiency across non-life insurance firms globally, found that South African firms performed relatively well in risk management but struggled with operational efficiency. In particular, Alhassan and Boakye (2020) found that South African non-life insurers are relatively efficient compared to other emerging markets, but the sector still faces challenges related to claims processing and risk management. Clemente et al. (2018) highlighted that non-life insurers often face significant challenges due to claims volatility, particularly in regions with high levels of motor vehicle accidents and property damage. In South Africa, the high frequency of claims in motor insurance has been cited as a driver of inefficiency in studies such as Ndlovu (2021).

Nguyen and Worthington (2020) provide additional global context by showing that non-life insurers in developing countries tend to be less efficient than their counterparts in developed markets due to weaker regulatory frameworks and higher operational costs. This is particularly relevant in South Africa, where despite a robust regulatory environment, challenges such as fraud and the cost of reinsurance continue to affect efficiency. Studies like those of Alhassan and Boakye (2020) and Abdulraheem-Saheed (2022) have highlighted the significance of regulatory environments in determining the efficiency of both life and non-life insurance segments. However, the South African insurance industry operates under a robust regulatory framework which can sometimes hinder market competitiveness and innovation while ensuring stability (Msomi and Nyide, 2021). South African insurers are also affected by macroeconomic factors, including inflation and unemployment, which reduce consumers' ability to purchase insurance products, leading to inefficiencies in both life and non-life insurance markets (Zinyoro and Aziakpono, 2024).McCue and Hall (2014) suggest that non-life insurers can improve efficiency through better risk pooling and the adoption of more advanced actuarial models

2.8 Empirical Literature

2.8.1 Data Envelopment Analysis (DEA) and the Stochastic Frontier Analysis (SFA)

The purpose of conducting an efficiency analysis is to examine and determine efficient entities to non-efficient entities, therefore, this analysis separates entities that perform well from entities that perform poorly. This outcome is achieved through the estimation of an efficient frontier in an ecosystem or market which is then used to compare the performance of all other entities in that ecosystem. Two common approaches used in estimating efficiency are the Data Envelopment Analysis (DEA) and the Stochastic Frontier Analysis (SFA).

The DEA estimation technique is a non-parametric approach that uses linear programming to develop efficient frontiers which envelop all input-output combinations of entities within a sample (Ndlovu, 2022). The input-output combinations of efficient entities are found on the frontier where those of inefficient entities are found below the efficient frontier. The DEA approach can accommodate multiple input-output combinations and it does not need assumptions on distribution type or functional form to be determined beforehand, which makes the approach less sensitive to misspecification (Eling and Luhnen, 2010). The deterministic nature of the DEA estimation

technique implies that all deviations from the efficient frontier are derived from inefficiency which results in statistical noise from data measurement errors (Barros and Wanke, 2014).

The SFA estimation technique hypothesises a functional relationship amongst inputs and outputs to employ statistical procedures that determine parameters for the function. The SFA approach includes an error composed of two additive elements; (i) it includes a symmetric component which considers statistical noise associated with data measurement errors, and (ii) it includes a non-negative component that estimates inefficiency (Coelli, 1995). A limitation of the SFA technique is that it imposes assumptions on the distribution error term and the functional form of the efficient frontier (Ndlovu, 2021). Coelli (1995), Carrington, Coelli and Prasada (2011) state that key shortcomings of the DEA approach is that it is susceptible to measurement errors, outliers in the data and noise. The DEA and SFA estimation approaches both have limitations which is why this study employs and compares both techniques to estimate the efficiency scores for the medical scheme market in South Africa.

2.8.2 Empirical Insights

The empirical analysis of the efficiency of medical schemes has been undertaken to assess the range of efficiency of medical schemes and health insurers. Yang and Wen (2017) conducted a DEA Analysis to determine the performance of the health insurance consumer-operated and oriented plan (CO-OPs) and concluded that efficiency and financial viability for these entities was dependent on their ability to incorporate cost reductions or rely on premium increases and subsidies. The studies above, while focused on different markets, highlight the importance of managing costs with an emphasis on this intervention for not-for-profit medical schemes that are limited in their ability to become profit-maximising entities. Premium setting processes are a common component discussed in recommendations as the flexibility by which firms can change this factor significantly influences their respective efficiency. Allowing firms to have the flexibility to set increases in premiums would promote greater competition in the industry as they would compete on price which would lead them to adjust their actions to improve efficiency (Nguyen and Worthington, 2020).

Clemente *et al.,* (2018) conducted a bimodal two-step approach of the DEA technique to distinguish sustainable management practices for Brazilian health insurance companies. The paper

preferred the DEA method to the SFA as the DEA is most ideal for operational research studies. The results highlighted the difference between not-for-profit entities and for-profit entities as the latter have a mandate to optimise profits, therefore, the operational decision focuses on cost control and improving efficiency. Golden and Yang (2019) assessed the impact of health insurers' scale of operations and efficiency based on the dynamics of health insurance mergers and acquisitions. This is a common market activity in South Africa which warrants it as a variable of consideration when assessing competition and efficiency. The study found that most insurers are scale inefficient and that big sized firms – in the top 20% by monthly members enrolled – are most efficient (Golden and Yang, 2019).

Nguyen and Workington (2021) in the industry analysis of Australian private health insurers determined that the industry technical efficiency is 91.6% and its scale efficiency is 95.1%, therefore concluding that most inefficiency in the study was technical. The drivers of efficiency in this study included insights on the way heavy industry regulation results in an efficiency trade-off. Ndlovu (2021) in a similar study on open and restricted medical schemes in the South African market from 2011 to 2017 found that open medical schemes achieved, on average, efficiency scores of 98%, 94% and 92% for scale, pure technical and technical efficiency, while restricted medical schemes achieved scores of 98%, 87% and 85% for scale, pure technical and technical efficiency, respectively. The differences between open and closed schemes are accredited to the higher propensity for competition in open schemes as they are accessible to more members of the public and can compete to attract new members by charging lower premiums and offering better services (Erasmus and Theron, 2016). Restricted medical schemes do not have the same incentives to compete thereby implying that each restricted scheme holds a hypothetical monopoly over groups or unions of members and are led to prefer a quiet life free from competition. This hypothesis is discussed in further detail below; however, its outcomes include limited incentives for improving competition and operations conducted under reduced efficiency levels.

2.8.3 Quiet-Life Hypothesis

The quiet-life hypothesis is a theory that explains the relationship between competition and efficiency (Hicks, 1935). The hypothesis proposes that firms in less competitive markets tend to be less efficient because they face less pressure to improve their operations, while firms in highly

competitive markets tend to be more efficient because they face constant pressure to improve and innovate Lee, Park, Lim and Park (2015). In the case of this study and the existing literature, the former relates to restricted medical schemes and the latter relates to open medical schemes.

A study by Hausman and Taylor (1981) provided empirical evidence in support of the quiet-life hypothesis. The study analysed the relationship between competition and efficiency in the U.S. electric utility industry and found that firms in less competitive markets tended to have higher operating costs, lower productivity, and lower profitability than firms in highly competitive markets. In the healthcare sector, several studies have examined the relationship between competition and efficiency. A study by Dranove and Shanley (1995) analysed the relationship between HMO (Health Maintenance Organization) competition and efficiency in the U.S. healthcare industry. The study found that HMOs in highly competitive markets tended to be more efficient than those in less competitive markets. This was attributed to the fact that highly competitive markets exerted pressure on HMOs to reduce costs, improve quality, and innovate to remain competitive. In the South African context, a study by Otchere (2014) analysed the efficiency of medical schemes in South Africa using a DEA method. The study found that some medical schemes were less efficient than others, and that there was room for improvement in the industry's overall efficiency. The author concluded that increased competition and regulatory interventions could improve efficiency and promote consumer welfare in the medical scheme market (Otchere, 2014).

In the study on the financial health of medical schemes, Alhassan (2023) states that the effect of market concentration on the financial performance of a medical scheme is supported by the structure-conduct-performance (SCP) theory. This theory indicates that in structured markets (concentrated markets), firms collectively conduct (collude) to charge higher prices which results in higher performance. However, the efficient structure theory posits that competitive pressure improves efficiency thereby challenging the SCP theory (Alhassan, 2023). This study intends to employ the Herfindahl Hirschman Index (HHI) index as a proxy for market structure and concentration similar to Alhassan (2023) as well as Alhassan and Biekpe (2015).

The quiet-life hypothesis provides a useful framework for understanding the relationship between competition and efficiency. Empirical evidence from various industries, including healthcare,

supports the hypothesis that increased competition can promote scale, technical and pure technical efficiency.

2.9 Summary

The literature on efficiency and competition within the South African medical scheme market, as well as life and non-life insurance segments, presents a wide array of findings. Studies on the medical scheme market, such as those by Alhassan et al. (2023), focus on differentiating between open and closed schemes, revealing higher efficiency in restricted schemes. However, the methodologies employed in this field vary, with some studies utilising data envelopment analysis (DEA) and others preferring stochastic frontier analysis (SFA), leading to inconsistent results when comparing efficiency across the board. In addition, competition appears to have a nuanced impact on efficiency, as larger schemes benefit from economies of scale, but smaller schemes struggle with market fragmentation and administrative burdens (Alhassan and Biekpe, 2016).

Extending the scope to life and non-life insurance segments, the literature reveals similar issues regarding market concentration and efficiency (Msomi and Nyide, 2021). In the life insurance sector, large players dominate, which is argued to enhance operational efficiency, though at the potential cost of market competitiveness (Ige-Gbadeyan and Swanepoel, 2023). On the other hand, non-life insurance is more fragmented, with smaller firms competing fiercely. These firms, while fostering competition, often face challenges in achieving optimal efficiency due to limited resources and high claims ratios (Ige-Gbadeyan, 2023). Despite these insights, there remains a gap in the literature regarding the comparative analysis of efficiency determinants across different insurance segments, as well as the role of regulation in mediating efficiency and competition dynamics.

The following table provides a critical synthesis of the literature, highlighting gaps, contradictions and areas requiring further research.

Table 2.3: Summary of Existing Literature

Study	**Segment**	**Methodology**	**Key Findings**	**Gaps and Contradictions**
Alhassan (2023)	Medical Schemes	DEA	Restricted schemes are more efficient than open schemes.	Does not address the impact of regulatory changes post-2021.
Alhassan and Biekpe (2016)	Non-life insurance	SFA	Competition has a negative impact on efficiency in medical schemes.	Contradicts other studies that suggest competition fosters innovation and efficiency.
Clemente et al. (2018)	Medical Schemes	DEA, SFA	Larger schemes benefit from economies of scale, improving efficiency.	Does not sufficiently differentiate between market segments (open vs. restricted).
Msomi and Nyide (2021)	Life Insurance	SFA	Large life insurers are more efficient due to economies of scale.	Focuses on operational efficiency but does not account for customer service efficiency.
Ige-Gbadeyan and Swanepoel (2023)	Life Insurance	DEA	Life insurance firms exhibit significant efficiency variation across the market.	The relationship between efficiency and product diversity is underexplored.
Ige-Gbadeyan (2023)	Non-life Insurance	DEA	Claims management is a key determinant of efficiency in non-life insurance.	Lacks analysis of external factors like economic instability on claims and efficiency.
Alhassan and Boakye (2020)	Life Insurance	DEA	LIife insurance in South Africa is relatively efficient compared to other African markets.	Does not address potential inefficiencies due to evolving regulatory frameworks.
Abdulraheem-Saheed (2022)	Life Insurance	DEA	Focuses on emerging markets' life insurance efficiency, highlighting operational gaps.	Limited ability to generalise results to suit South Africa due to differences in market structure and regulatory conditions
Zinyoro and Aziakpono (2024)	Non-life Insurance	DEA, Panel Regression	Non-life insurers face high volatility in claims ratios, affecting efficiency.	Does not examine the long-term sustainability of current competition strategies in non-life insurance
Eling and Luhnen (2010)	All insurers	Meta-analysis	Global review of efficiency determinants, highlighting the role of competition.	Lacks specific focus on developing markets like South Africa, where regulatory conditions differ greatly.
Ndlovu (2021)	Medical Schemes	Case Study	Data granularity issues in South African schemes limit the accuracy of efficiency estimates.	More detailed, scheme-level data is needed to refine efficiency measurements.

Source: Author’s compilation

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the methodology, data collection and analysis process of the medical scheme market in South Africa from 2011 to 2021. The chapter will first establish the research design and empirical techniques to be applied to the data. An analysis on the various methodologies used in the medical scheme research literature will be included to provide justification for the research design utilised in the study of this paper.

3.2 Research Approach

The philosophy that underlies the research activity is a fundamental part of research. The research in literature is based on four philosophical foundations: post-positivism, constructivism, transformational, and pragmatism (Creswell and Creswell, 2018). Post-positivism, as defined by Cresswell and Cresswell (2018, p. 44), is a philosophical approach that posits causes likely determine effects or outcomes. It is primarily concerned with using empirical methods to ascertain results. This philosophy integrates deductive reasoning with empirical investigation (Antwi Kwadwo and Hamza, 2015). This philosophical standpoint acknowledges the incremental and probabilistic character of comprehending a certain subject topic. The research was grounded on a postpositivist worldview, aiming to address the research questions raised in the first chapter regarding the relationship between financial development and poverty reduction in South Africa.

3.3 Research Design

The research approach can be categorised into three primary types: inductive, deductive, and abductive. The choice of research methodology is influenced by the researcher's rationale (Saunders, Lewis, and Thornhill, 2016). Inductive reasoning is employed in situations where there is a scarcity of information on the subject matter. In such cases, the researcher does not start with preconceived hypotheses and instead relies on data exploration and theory development (Saunders et al., 2016). The inductive technique, as described by Leedy and Ormond (2016), involves making generalisations about a larger population based on observations and analysis of a smaller sample size. On the other hand, deductive reasoning utilises established research to ascertain and verify the soundness of theories/hypotheses. This methodology commences by formulating a theoretical

framework and subsequently either expanding upon the preexisting theory or subjecting it to empirical examination (Saunders et al., 2016).

The abductive approach integrates the inductive and deductive approaches, allowing the researcher to transition between data and theory, as well as theory and data. This methodology commences by utilising fragmentary observations and endeavours to construct a convincing explanation (Leedy and Ormond, 2016; Saunders et al., 2016). This study presents an examination of competition and efficiency in the medical scheme market, employing an empirical deductive approach.

3.4 Sample and Data Sources

The data utilised in this study consists of quantitative data which is obtained from the annual reports of the selected medical scheme providers for the 2011 to 2021 period. This data consists of annual income statement and balance sheet data on all medical schemes which totalled 97 in 2011 and 75 in 2021 (CMS, 2021). The sample comprises medical schemes of varying sizes and business models being open schemes and restricted schemes. The information derived from the annual reports is expected to be accurate, valid and reliable as the annual reports are audited by accredited audit firms and issued publicly by the medical scheme providers and CMS.

3.5 Empirical Model

The model of Alhassan and Biekpe (2015) is employed to examine the empirical relationship between competition and efficiency in the medical scheme market in South Africa. The model is defined below:

$$eff_{it} = \beta_0 + \beta_1 hhi_{it} + \beta_2 m\_fund_{it} + \beta_3 \log\_mem_{it} + \beta_4 tech\_prov_{it} + \varepsilon_t$$

Where:

- eff is a measure of efficiency developed using the stochastic frontier analysis.
- hhi is the Herfindahl Hirschman Index measuring the competitiveness of the market.
- m_fund is the members' funds as a proportion of total assets.
- log_mem is the natural logarithm of membership of medical scheme as the proxy for medical scheme size.

- tech_prov measured as the ratio of outstanding claims provisions to net contributions to examine the potential of earnings management.
- ε_t is the error term.

3.6 Measurement and Description of Independent Variables

3.6.1 Competition

The impact of competition on efficiency has been termed the "Quiet-Life" hypothesis by Hicks (1935) in a theoretical relationship that suggests that market power in dynamics with less competition results in less managerial control to manage cost and other factors that impact efficiency. This hypothesis is validated in Alhassan and Biekpe (2016) as the findings indicate a positive effect of competition on cost and profit efficiency with the overall conclusion being that competition improves efficiency. Alhassan and Biekpe (2016) found the mean for competition (termed diversification) through the hypothesis of conglomeration was 0.3756 with a standard deviation of 0.2751 using the Herfindal index. Carrington, Coelli and Prasada (2011) determined that within the Australian private health insurance market, the average technical efficiency rate was 97% across a competitive landscape of 40 funds over 2004-2005. In an empirical study on the hospital competition and efficiency using the Hirschman-Herfindahl Index (HHI), the findings indicated a statistically significant and positive relationship between efficiency and market concentration (Chua, Palangkaraya and Yong, 2011). This finding differs slightly from that of Lee, Park, Lim and Park, S. (2015) where there is a negative and statistically significant relationship between technical efficiency and competition as findings indicated that entities in less competitive markets had lower technical efficiency scores than those in more competitive markets. FinMark Trust (2016) reported that disparities in efficiency exist between open and restricted medical schemes due to a large number of sub-pools which cause fragmentation.

3.6.2 Technical provisions

Technical provisions are measured as the ratio of outstanding claims provisions to net contributions to examine the potential of earnings management. The study by Clemente et al., (2018) focused on analysing the financial sustainability of private health companies to find

practical implications by which the insights could contribute to the implementation of management tools for the sustainability of these organisations. Although the analysis was not empirical in nature, the findings from the study indicate that financial management tools – including funding and investment management of earnings – contribute to higher efficiency within firms across the spectrum from not-for-profit entities to for-profit private companies (Clemente et al., 2018). McCue and Hall (2014) found that in the American market, the quality of improvement and efficiency of health insurance was positively related to its financial performance. The study found that firms with large, sophisticated employers, such as those characteristic of closed medical schemes, were more likely to adopt quality improvement leading to better financial performance and efficiency owing to the possible greater regulation and responsibility by the institutional members (McCue and Hall, 2014).

3.6.3 Scheme size (Membership)

Alhassan and Biekpe (2016) in their study on competition and efficiency in the non-life insurance market in South Africa, studied size of entity through the hypothesis of economies of scale. Although the industry focus differs, the hypothesis is aligned with that of this study and their findings indicate that size has a significant relationship with efficiency as cost and profit efficiency are intended to improve with large firms because of increased market share and reduced cost per unit. Ndlovu (2022) highlights this relationship in a study on the medical scheme market in South Africa by noting that the plausible difference between open and closed medical schemes is the fact that open schemes are open to more members of the public. This enables them to attract greater numbers and greater levels of efficiency at 95% due to their increased competitive nature to gain market share where the efficiency in closed medical schemes averaged at 90%. However, Fama and Jensen (1983) note the difficulty of managing and monitoring large scale operations which could result in wastage and reduced efficiency. In South Africa, open and restricted medical schemes have varying structural features with the latter being a specified and targeted health funding solution to a defined employer base. Each medical scheme fund type is thus limited by the terms of potential scope for growth by size of employer group thereby affecting efficiency (FinMark Trust, 2016). The empirical evidence of size-efficiency relationship in the medical scheme market remains inconclusive.

3.6.4 Members fund (Equity)

Members Fund is termed as the proportion of total assets of a medical scheme or the equity of a medical scheme. The indicators that influence total assets in private health companies included the level of formalisation in financial management which includes resource allocation policies and tax planning (Clemente et al., 2018). The study found that the presence of specific policies prevalent in private profit-optimising firms contributed to outcomes that exceeded those of entities that did not implement effective asset management policies. A study by Carrington, Coelli and Prasada (2011) noted that various proxies have been used to determine financial intermediation as financial assets and return, or influence of assets on efficiency. However no recognisable trend has been observed over time. In this regard, most health fund investments and assets are held as cash or interest-bearing assets and their returns are often volatile in a manner that is beyond the control of management. Thus, in Carrington, Coelli and Prasada (2011), this variable was combined with premiums and investment income in an approach consistent with the national accounts division of the Australian insurance companies. The literature has limited insights on the relationship between members' funds (or total assets of a medical scheme) and efficiency which deems the relationship inconclusive.

3.7 Estimation Techniques

The estimation technique used for the regression of the panel data incorporates fixed and random effects models and the application of the Hausman test. The independent variables for the regression include competition (hhi), members fund/total assets (m_Fund), total membership of the medical scheme (log_mem), and outstanding claims provisions to net contributions (tech_prov).

The dataset employed in this study comprises a panel data structure with observations over multiple time periods from 2011 to 2021 for each medical scheme. Panel data allows for the exploration of time-series and cross-sectional variations, providing a comprehensive understanding of the relationships between variables (Wooldridge, 2005). Fixed effects are appropriate when there are time-invariant unobservable heterogeneities across medical schemes (Wooldridge, 2005). Random effects are suitable when these unobservable effects are uncorrelated with the independent variables. The theoretical choice between the two models is dependent on

the nature of the unobservable factors (Wooldridge, 2005).

3.7.1 Fixed Effects Model

The fixed effects model controls for time-invariant unobservable heterogeneity at the medical scheme level (Wooldridge, 2005). This model is expressed as:

$Y_{it} = \beta_0 + \beta_1 hhi_{it} + \beta_2 m\_fund_{it} + \beta_3 \log\_mem_{it} + \beta_4 tech\_prov_{it} + \propto_i + \varepsilon_{it}$

where Y_{it} represents the dependent variable, β_0 is the intercept, β_1, β_2, β_3, β_4 are the coefficients of the independent variables, $\propto_i$ represents the fixed effects for each medical scheme, and $\in_{it}$ is the error term.

3.7.2 Random Effects Model

The random effects model assumes that unobservable heterogeneity is uncorrelated with the independent variables (Wooldridge, 2005). The model is expressed as:

$Y_{it} = \beta_0 + \beta_1 hhi_{it} + \beta_2 m\_fund_{it} + \beta_3 \log\_mem_{it} + \beta_4 tech\_prov_{it} + \propto_i + \mu_{it}$

where μ_{it} is the individual-specific error term.

3.7.3 Hausman Test

The choice between fixed and random effects models is crucial for the validity of the regression results. The Hausman test is employed to assess whether the unobservable individual effects are correlated with the independent variables (Hausman, 1978). The null hypothesis is that the random effects model is consistent, while the alternative is that the fixed effects model is consistent (Hausman, 1978). The Hausman test statistic can be computed as follows:

$$Hausman = (\beta_{FE} - \beta_{RE})'[Var(\beta_{FE}) - Var(\beta_{RE})]^{-1}(\beta_{FE} - \beta_{RE})$$

where β_{FE} and β_{RE} are the coefficient estimates from the fixed and random effects models respectively.

3.7.4 Comparison of Regression Results

In comparing the results from the fixed effects (FE) and random effects (RE) models, as well as conducting the Hausman test, several parameters and criteria will be considered. The parameters

for comparison for FE and RE include the coefficients which compare the estimated coefficients for the independent variables (hhi, m_fund, log_mem, tech_prov) across the fixed effects and random effects models to examine the direction and significance of coefficients. The Hausman test statistic presents a statistically significant test statistic which suggests the presence of endogeneity, favouring the fixed effects model (Wooldridge, 2005). Additional model fit statistics are conducted such as R-squared, adjusted R-squared or likelihood ratio tests for both FE and RE models. The Hausman test assesses the consistency of the random effects model against the fixed effects model (Hausman, 1978). The underlying theory suggests that if the unobservable individual effects are correlated with the independent variables, the fixed effects model is preferred as it accounts for this correlation (Hausman, 1978). If the Hausman test is statistically significant, suggesting the presence of endogeneity, the fixed effects model is the best model. This indicates that unobservable factors are correlated with the independent variables (Hausman, 1978). Theoretical considerations, such as the nature of competition (hhi), the impact of members fund (m_fund), the influence of total membership (log_mem), and the role of outstanding claims provisions to net contributions (tech_prov) in the medical scheme market, will guide the interpretation of coefficient signs and magnitudes. Assessing model fit statistics provides insights into the overall explanatory power of the models. A higher R-squared or likelihood ratio test statistic indicates a better fit (Chitiyo, 2017).

3.8 Summary

The selection of both Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) as research techniques in this study is driven by their complementary strengths in evaluating efficiency in competitive markets, such as the medical scheme market. DEA is a widely recognised non-parametric method used to measure the relative efficiency of decision-making units, such as medical schemes or insurance firms, based on multiple input and output variables. DEA's advantage is in its ability to handle multiple inputs and outputs without requiring a pre-specified functional form, making it particularly suitable for assessing efficiency across firms with different operational models (Alhassan et al., 2023). This feature is valuable in the context of the medical scheme market, where both open and restricted schemes operate under diverse regulatory and competitive conditions, and where traditional parametric models may fail to capture the full

spectrum of operational differences.

SFA offers a parametric approach to efficiency measurement, accounting for random errors and firm-specific inefficiencies (Alhassan and Biekpe, 2016). The inclusion of SFA is justified by its ability to decompose deviations from the production frontier into inefficiencies and statistical noise, which provides a more nuanced understanding of the factors contributing to efficiency variations. This is particularly important in highly regulated markets like South Africa's medical scheme industry, where external factors such as regulatory interventions or economic fluctuations might influence efficiency levels. SFA also allows for hypothesis testing regarding the impact of specific variables, such as competition and scheme size, on efficiency, which aligns with the study's objective of evaluating the role of these factors in shaping market dynamics.

By employing both DEA and SFA, this study leverages the strengths of non-parametric and parametric approaches, allowing for a robust and comprehensive analysis of efficiency in the medical scheme market.

CHAPTER FOUR: DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents the results of the hypothesis presented in this paper as outlined in Chapter 1 on the relationship between efficiency and medical schemes in South Africa from 2011 to 2021. The analysis begins with a discussion of the descriptive statistics for both open and restricted medical schemes, followed by a discussion of the regression output of competition and efficiency in the medical scheme market in South Africa.

4.2 Descriptive Statistics and Preliminary Tests

The summary of descriptive statistics is outlined in table 4.1 results for open (Panel A), closed (Panel B) and all medical schemes (Panel C). The efficiency scale score for panel A displays a mean of 96.7% with a standard deviation of 0.033 across 242 observations, indicating generally high efficiency. The Hirschman Index (hhi) reveals a moderately concentrated market (mean: 0.305, SD: 0.032). Outstanding claims provisions to net contributions (tech_pro) exhibit a moderate financial stance (mean: 0.046, SD: 0.020). The log of total membership (log_mem) shows a substantial scale (mean: 10.272, SD: 0.068). These findings underscore the interplay between competition, efficiency, and market dynamics in the context of open medical schemes with high efficiency, a higher quotient of competitive dynamics prevalent and a greater indication of membership. This is coherent with the nature of open medical schemes as detailed in annual reports with the definitions of the category stated by CMS (2021) where any individual may voluntarily join an open medical scheme thus making it a more competitive entity with regards to attracting scheme members repeatedly.

The efficiency scale score for closed schemes (Panel B) has a high average of 98.2%, which indicates a high level of overall efficiency. The Herfindahl Hirschman Index (HHI) indicates a moderate level of market concentration, with a mean value of 0.250. The outstanding claims provisions to net contributions (tech_pro) suggest a moderately positive financial position, with a mean value of 0.041. The logarithm of the overall membership, represented as log_mem, consistently demonstrates a mean scale of 9.021. The findings reveal a complex situation in the medical scheme sector, marked by strong effectiveness, moderate market dominance, varied

financial strategies and stable membership levels among closed medical schemes.

Table 4. 1: Descriptive Statistics

	EFF	HHI	M_FUND	LOG_MEM	TECH_PROV
			Open Schemes		
Mean	0.967	0.305	0.752	10.272	0.046
Median	0.976	0.307	0.762	10.255	0.044
Std. Dev	0.033	0.032	0.125	0.068	0.02
Minimum	0.898	0.243	0.232	10.175	0.000
Maximum	1.000	0.346	0.976	10.369	0.146
N	242	242	226	241	230
Closed Schemes					
Mean	0.981	0.249	0.829	9.021	0.041
Median	0.979	0.246	0.857	9.037	0.037
Std. Dev	0.018	0.018	0.116	0.039	0.019
Minimum	0.945	0.208	0.209	8.935	0.000
Maximum	1.000	0.277	0.995	9.058	0.185
N	660	660	646	660	649
All Schemes					
Mean	0.979	0.265	0.809	9.344	0.042
Median	0.977	0.262	0.831	9.35	0.039
Std. Dev	0.018	0.033	0.123	0.027	0.019
Minimum	0.947	0.208	0.209	9.288	0.000
Maximum	1.000	0.346	0.995	9.383	0.185
N	902	902	872	902	879

Note: eff= technical efficiency, hhi = herfindahll hirschman index, m_fund = members funds/total assets, log_mem is log of total membership of medical schemes, tech_prov = outstanding claims provisions to net contributions

The efficiency scale score for all medical schemes (Panel C in Table 4.1) averages at 97.9% (SD: 0.019), indicating commendable overall efficiency among 902 observations. The Herfindahl Hirschman Index (hhi) portrays a moderately concentrated market (mean: 0.265, SD: 0.033). Outstanding claims provisions to net contributions (tech_pro) reveal a balanced financial stance (mean: 0.042, SD: 0.020). The log of total membership (log_mem) underscores a substantial scale (mean: 9.345, SD: 0.027). The findings are reflective of the insights derived from the individual data for open and closed medical schemes reported in table 4.1 and 4.4 respectively. The insights for the combined medical scheme market reveal a high level of efficiency, moderate market dominance and a higher scale for membership influenced by that of open medical schemes which on average have a larger number of members than closed medical schemes (CMS, 2021).

The examination of efficiency between open and closed medical schemes, as displayed in table 4.1 demonstrates significant resemblances and disparities. When considering average efficiency, closed schemes (panel B) have a slightly better efficiency scale factor 98.2% compared to both open schemes 96.7% (panel A) and the combined dataset 97.9% (panel C). These results are aligned to those conducted in studies such as Ndlovu (2022) where the efficiency for restricted medical scheme was 98%, which appears to have remained unchanged and that for open medical schemes was 98%, which has now decreased slightly to 96.7%. Nguyen and Workington (2021) in the analysis of the Australian private health insurance market found an industry technical efficiency of 91.6%. Given that a variety of unassessed dynamics contributes to these measures, it may be safe to assume that the efficiency of the South African medical scheme market is on par with global efficiency standards. The tables above exhibit minimal standard deviations, suggesting a high degree of stability in efficiency levels within each category. Open schemes exhibit a broader range (minimum to maximum: 0.898 to 1) compared to closed schemes (minimum to maximum: 0.945 to 1), indicating a slightly higher degree of variability in technical efficiency among open medical schemes. While evaluating all schemes collectively through the merged dataset (panel C), the data shows alignment with the efficiency range reported in closed medical schemes highlighting the convergence of efficiency values across various scheme types. This analysis examines subtle differences in technological efficiency among open and closed medical schemes, providing useful insights into the complexities of competition and efficiency dynamics within the

medical scheme market.

4.3 Correlation results

The correlation matrix is presented in table 4.2 for the combined medical scheme industry including both closed and open medical schemes. There is no multicollinearity observed among the independent and control variables as all correlation coefficients are well above the multicollinearity threshold of 0.7 (Kennedy, 2008). The independent variables have low correlation scores, however, the highest correlation score of 0.516 with a significant level of 1% shows is a positive correlation between log of total membership of medical schemes indicating that medical schemes with greater numbers of members would likely have significant impact on the efficiency of the medical scheme. The Herfindahl Hirschman Index (HHI) is significant at a 1% level with an extremely low score of 0.006. This is aligned to the structure of medical schemes which is not intended to be competitive as prescribed by CMS (2021).

Table 4. 2:Correlation Results

	EFF	HHI	M_FUND	LOG_MEM	TECH_PROV
			Open Schemes		
EFF	1.000				
HHI	-0.505***	1.000			
M_FUND	0.028	-0.017	1.000		
LOG_MEM	-0.466***	0.259***	0.039	1.000	
TECH_PROV	-0.076	0.143	0.045	-0.016	1.000
			Closed Schemes		
EFF	1.000				
HHI	-0.111***	1.000			
M_FUND	0.001	0.080	1.000		
LOG_MEM	0.09***	0.845	0.069	1.000	
TECH_PROV	-0.037	0.002	-0.101	-0.025	1.000
			All Schemes		
EFF	1.000				
HHI	-0.006***	1.000			
M_FUND	0.018	-0.169	1.000		
LOG_MEM	0.516***	0.390**	0.054	1.000	
TECH_PROV	-0.048*	0.126	-0.096*	-0.005	1.000

Note: EFF=Technical efficiency for open, closed and all medical schemes respectively, HHI=

Herfindahl Hirschman index, M_FUND = members funds/total assets, LOG_MEM is log of total membership of medical schemes, TECH_PROV = outstanding claims provisions to net contributions. ***, ** and * denotes significance at 1%, 5% and 10% respectively.

Source Author's estimate derived from research data.

Appendix A reports additional econometric tests for open medical schemes. Table A.1 reports the multicollinearity test results which indicate a mean VIF of 1.04 indicating that variables in this model do not suffer from multicollinearity. In addition, the Wooldridge test for serial correlation in table A.3 indicates the model does not suffer from serial correlation, however, cross sectional dependence exists between the medical schemes. Also, the test for groupwise heteroscedasticity in table A.4 indicates that the model does not suffer a non-constant variance. Results for the Hausman test in table A.5 show that the preferred model is the random effects. The correlation matrix in table 4.2 depicts that the estimated coefficients for the independent variables is below the 0.7 threshold level, therefore hinting that there will be multicollinearity when all variables are included in the random effects regression model for open medical schemes (Kennedy, 2008).

Appendix B reports additional econometric tests for closed medical schemes. The mean VIF in table B.1 reports the expected range of less than 5 at 2.75 indicating the non-existence of multicollinearity with the variables in this model. Table B.2 reports the Peseran test for cross-sectional dependence and shows that closed medical schemes have a statically significant p-value indicating inter-relationships within the medical schemes in this industry category. Furthermore, the Wooldridge test for serial correlation in table B.3 is another indication of the presence of serial correlation. According to the Hausman test in table B.5, the random effects model is preferred as the best model to estimate the relationships for closed medical schemes. The correlation matrix in table 4.2 depicts that all except one, which is log_mem and hhi at 0.845, of the estimated coefficients for the independent variables are below the 0.7 threshold level (Kennedy, 2008). Further details of these econometric results for closed medical schemes are reported in Appendix B.

Appendix C reports additional econometric tests for all medical schemes. Table C.1 reports the mean VIF for variables in this model which is 1.139 indicating that there is no multicollinearity amongst the variables in the combined medical scheme model. The model exhibits statistically significant p-values through the test for cross-sectional dependence in table C.2 indicating underlying relationships between the medical schemes in this model. In addition, the test for serial correlation in table C.3 provides a statistically significant p-value indicating that the model suffers from serial autocorrelation. However, the Wald test for heteroscedasticity in table C.4 indicates an insignificant p-value signifying that the model does not suffer from heteroscedasticity. The Hausman test in table C.5 provides a statistically significant p-value favouring the fixed effect over the random effect as the best model to estimate amongst medical schemes. The results of these econometric tests are fully presented in appendix C.

4.4 Regression Results

The findings on the relationship between efficiency and competition in the medical scheme market in South Africa are discussed in this section. Table 4.3 presents the regression results of competition and efficiency in the open, closed and combined medical scheme industry in South Africa from 2011 to 2021. The regression results offer useful insights into the correlation between efficiency and crucial variables across both open and closed medical schemes.

The external validity tests in appendix A, B and C find that the random and fixed effects regression models are the best predictor of the relationship between competition and efficiency in the medical scheme market in South Africa. The random effects regression model was conducted for open schemes and closed schemes. The fixed effects regression model was conducted for the combined industry analysis (All Schemes).The random effects model explained 37.9% of the variation in open medical schemes and 13.6% of the variation in closed medical schemes. The fixed effects model explained 40.8% of the variability in the regression indicating that the remaining 60% is explained by factors that influence efficiency in the medical scheme market.

Table 4. 3: Competition and Efficiency Open Medical Schemes - Random Effects

	A		B		C	
	Open Schemes		**Closed Schemes**		**All Schemes**	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
HHI	-0.418***	-7.58	-0.661***	-9.59	-0.330***	-12.4
	(0.055)		(0.069)		(0.027)	
M_FUND	0.009	0.69	0.001	0.16	-0.008	-0.087
	(0.013)		(0.006)		(0.009)	
LOG_MEM	-0.172***	-6.73	0.315***	9.58	0.498***	23.03
	(0.026)		(0.033)		(0.022)	
TECH_PROV	-0.062	-0.69	-0.023	-0.63	-0.069*	-1.75
	(0.089)		(0.036)		(0.039)	
Constant	2.86***	11.00	-1.69***	-6.00	-3.576***	-18.08
	(0.26)		(0.282)		(0.198)	
Wald *F*	135.086		100.967		135.470	
Prob > *F*	0.000		0.000		0.0000	
R-squared	0.379		0.136		0.408	
Hausman χ^2	2.696	0.61	0.290	0.99	103.824	0.00
Prob > χ^2	0.0000		0.000		0.000	
Number of Schemes	22		60		82	
Observations	226		646		872	

Note: eff efficiency, hhi = Herfindahl hirschman index, m_fund = members funds/total assets, log_mem is log of total membership of medical schemes, tech_prov = outstanding claims provisions to net contributions *** p<.01, ** p<.05, * p<.1

The coefficient of market concentration (Herfindahl Hirschman Index (HHI) is negative in both open and closed schemes, suggesting that as market concentration diminishes (competition increases), efficiency tends to increase (Alhassan, 2023). This is consistent with Hausman and Taylor (1981) whose empirical evidence supports this observation through the Quiet-Life Hypothesis as well as Lee, Park, Lim and Park (2015). The results reveal that closed schemes exhibit a more substantial inverse correlation (coefficient: -0.661, $p<0.01$) in comparison to open schemes (coefficient: -0.418, $p<0.01$). This implies that a decrease in market concentration has a more noticeable effect on efficiency inside closed schemes. Otchere (2014) in the study on efficiency in South African medical schemes found similar insights indicating that some medical schemes were less efficient than others and, in this case, the data indicates that open medical schemes are slightly less efficient than closed medical schemes. The comprehensive study of all schemes (coefficient: -0.330, $p<0.01$) reveals a much weaker negative correlation compared to closed schemes. This suggests that factors other than market concentration may also play a role in determining overall efficiency. The disparities in efficiency between open and closed medical schemes is reflective of the report on Challenges and opportunities for health finance in South Africa by FinMark Trust (2016).

When it comes to the provisions for outstanding claims to net contributions (tech_pro), both open and closed schemes do not exhibit statistically significant coefficients. This suggests that this variable may not be a reliable predictor of efficiency in any kind of scheme. This is consistent with the literature which used various measured to assess the impact of earning management on the efficiency of medical schemes in the study on the market in Brazil in Clemente et al., (2018) and in the study on the Australian market in McCue and Hall (2014).

The logarithm of the total membership (log_mem) has a negative correlation with efficiency in open schemes (coefficient: -0.176, $p<0.01$), while it shows a positive correlation in closed schemes (coefficient: 0.316, $p<0.01$). This indicates that the more total members that a scheme has acquired, the lower the rate of efficiency in that scheme. The findings of this paper differ from those in Ndlovu (2022) where the medical schemes with greater numbers attracted strategies to improve efficiency in order to gain market share. This data point would require further study and analysis

to be regarded as a conclusive insight on the dynamics of the market. The combined model, with a coefficient of 0.498 and a significance level of $p<0.01$, highlights the favourable influence of membership scale on efficiency in all medical scheme types.

To summarise, although both open and closed schemes experience a decrease in market concentration, closed schemes demonstrate a more prominent correlation. Moreover, the influence of the size of membership on efficiency seems to differ across open and closed schemes, highlighting the intricate dynamics at work in the medical scheme industry in South Africa.

4.5 Summary

The results of this study offer a detailed understanding of the relationship between efficiency and competition in the South African medical scheme market from 2011 to 2021, with significant insights into both open and closed schemes. The negative relationship between market concentration, as measured by the Herfindahl Hirschman Index (HHI) and efficiency is evident across both open and closed schemes, aligning with the findings of Alhassan (2023), who observed a similar pattern in the Ghanaian insurance market. This result supports the Quiet-Life Hypothesis, as posited by Hausman and Taylor (1981), which suggests that increased competition pushes firms to operate more efficiently. The stronger negative correlation in closed schemes (-0.661, $p<0.01$) compared to open schemes (-0.418, $p<0.01$) indicates that closed schemes respond more sensitively to reductions in market concentration, possibly due to their more stable and restricted membership bases, allowing for more focused operational improvements (Otchere, 2014).

The analysis of membership size reveals diverging effects between open and closed schemes. Open schemes exhibit a negative correlation between membership and efficiency (-0.176, $p<0.01$), implying that larger open schemes struggle to maintain efficiency, possibly due to administrative complexities and higher operational costs as they scale. In contrast, closed schemes show a positive correlation (0.316, $p<0.01$), suggesting that these schemes benefit from larger memberships, likely due to economies of scale and the ability to streamline operations within a defined group (Ndlovu, 2022). The combined model, which includes both scheme types, further underscores the beneficial effect of increased membership, with a positive coefficient of 0.498 ($p<0.01$). This aligns with prior studies, such as those by Clemente et al. (2018) and McCue and Hall (2014), which also highlight the mixed impact of scheme size on efficiency across different insurance markets.

The study reveals that the provisions for outstanding claims to net contributions (tech_pro) do not significantly affect efficiency in either open or closed schemes, echoing the results of similar studies in other markets, such as Clemente et al. (2018) and McCue and Hall (2014). This suggests that while claims management is critical for operational sustainability, it may not directly influence efficiency metrics within the South African medical scheme context.

n conclusion, while competition appears to enhance efficiency across the board, its impact is more pronounced in closed schemes, which seem to benefit more from a competitive environment. The relationship between scheme size and efficiency is more complex, with closed schemes leveraging larger memberships for better efficiency, while open schemes face challenges as they grow (Alhassan and Biekpe, 2016). These results highlight the nuanced dynamics of the medical scheme market in South Africa and point to the need for further research to explore additional factors influencing efficiency, such as regulatory frameworks and administrative costs (Ndlovu, 2022).

CHAPTER FIVE: CONCLUSION

5.1 Introduction

This paper conducts an empirical analysis of the medical scheme market in South Africa, utilising both open and restricted data spanning the years 2011 to 2021. The primary focus of the study is on competition and efficiency within the market, with an aim to provide insights into the dynamics of the South African healthcare landscape. This chapter provides the conclusion of the analysis by beginning with the analysis of findings from the analysis followed by the policy recommendations based on the findings of the study that would encourage greater efficiency within the medical scheme market in South Africa. This section is concluded by a discussion on the plausible avenues for future study based on the limitation and opportunities identified during this study.

5.2 Conclusions of the Study

The thorough analysis carried out in this paper provides useful insights into the complex dynamics of competition and efficiency in both open and closed medical schemes. By analysing important variables such as the efficiency scale factor (eff), Herfindahl Hirschman Index (hhi), outstanding claims provisions to net contributions (tech_prov), members funds/total assets (m_fund) and the logarithm of total membership (log_mem), some significant patterns become apparent.

The efficiency levels, as measured by the efficiency scale factor, demonstrate excellent performance in both open and closed medical schemes. On average, closed schemes have a slightly higher efficiency scale factor at 98.1%, indicating a potential advantage in operational effectiveness. The Herfindahl Hirschman Index (hhi) indicates that both types of schemes have a modest level of market concentration. However, closed schemes show a stronger negative correlation between market concentration and efficiency with a 1% significance level.

The presence of outstanding claims provisions to net contributions (tech_prov) does not serve as a reliable indicator of efficiency in either type of scheme, suggesting that financial dynamics may operate independently from efficiency concerns. Nevertheless, the logarithm of the total membership (log_mem) reveals a complex correlation, where it has a detrimental effect on efficiency in open schemes and a beneficial impact in closed schemes, highlighting the contrasting influence of membership size on operational efficiency. To summarise, the results emphasise the

significance of considering both overall industry patterns and specific scheme dynamics when evaluating the impact of competition on improving efficiency. Although closed systems generally demonstrate superior efficiency levels, the correlation between important variables and efficiency differs between open and closed schemes. This highlights the necessity for customized tactics to enhance operational performance. Further investigation could analyse the underlying variables that contribute to variations in efficiency and examine approaches to improve effectiveness in both open and closed medical schemes.

5.3 Policy Recommendations of the Findings

The findings of this study are representative of the comprehensive medical scheme industry in South Africa from 2011 to 2021. Any industry requires clear policies and the lasting impact of the medical scheme industry indicates that policies are well communicated and implemented as the industry develops. Given the strong relationship between competition and efficiency, policymakers should consider strategies that promote greater competition within the medical scheme market, particularly in the open scheme sector, which appears to be less responsive to competitive pressures. Regulatory bodies, such as the Council for Medical Schemes (CMS), could implement policies that encourage innovation, reduce barriers to entry, and foster competition among medical schemes, potentially improving efficiency. Policies should be implemented to streamline administrative processes within medical schemes, reducing bureaucratic hurdles. This can lead to cost savings and increased operational efficiency. Insights and similar recommendations on the dynamics of administrative reforms – as outlined in the annual reports of the Council for Medical Schemes, Alhassan and Biekpe (2015) and Ndlovu (2022) – can provide guidance on implementing appropriate processes for the industry in South Africa. The Council for Medical Schemes should periodically assess market concentration levels and take proactive measures to prevent monopolistic tendencies. Encouraging entry of new players, especially in underserved regions, can promote healthy competition. The work of Erasmus and Theron (2016) on competition in healthcare markets underscores the importance of monitoring concentration levels to ensure fair competition. Policies should encourage the adoption of innovative technologies to improve healthcare delivery and administrative efficiency within medical schemes. Incentives for digital health solutions and electronic health records can contribute to improved

overall system efficiency. The importance of technological innovation in healthcare is emphasized by FinMark Trust (2016), who discusses the positive impact of digital solutions on efficiency and patient outcomes. Lastly, the role of regulation in balancing competition and maintaining quality of service should be carefully considered to avoid undermining the sustainability of schemes.

5.4 Avenues for Future Research

This paper has highlighted several insights with regards to the state of competition and efficiency in the South African medical scheme market. The insights presented by these opportunities as well as the limitations of this paper provide adequate avenues for future research which will enhance the body of study on empirical studies of this nature and on the prevailing dynamics in the medical scheme market.

The comprehensive analysis of all schemes revealed a weaker negative correlation to the same analysis conducted on closed schemes. This suggests that factors other than market concentration may contribute towards determining overall efficiency. Studies that investigate the determinants of efficiency in the medical scheme market would provide meaningful insights to the academic body of work. Studies such as Alhassan and Biekpe (2015) have been conducted to assess the determinants prevalent in the short-term insurance market; however, a focused study on the medical scheme market would be an avenue for study. While the findings of this study found that medical schemes operate with varied financial strategies, it did not however, include detail on the various financial strategies implemented, their origin and their impact on efficiency and competition in the industry. This would better inform the council for medical schemes and the industry players as to whether certain financial strategies outperform others within scheme types and between the categories of open and closed medical schemes when analysing the market in a comprehensive study.

South Africa is a market with disparities in socio-economic status, income levels, levels of education and varied levels of access to healthcare. Research on the influence of socioeconomic factors on individuals' decisions to participate in medical schemes is limited. Future studies could explore the impact of income levels, education, and geographic location on market participation. Longitudinal research examining efficiency trends over a longer time horizon could offer deeper insights into the long-term sustainability of medical schemes, particularly as healthcare demands

evolve in response to socio-economic changes. The work of Carrington, Coelli and Prasada (2011) on the economics of health insurance provides a foundational understanding which may be applied to the medical scheme market in South Africa. This analysis could be augmented by a view that tracks the differences between the pre- and post- apartheid era – a time in history whose dynamics and impact are unique to South Africa.

Previous research has highlighted the importance of regulatory frameworks in shaping the dynamics of healthcare markets. Investigating the impact of regulatory changes in the South African medical scheme market, particularly those implemented after 2018, could provide valuable insights. Relevant articles for reference include Fama and Jensen (1983) as well as McCue and Hall (2014) who examined the impact of regulatory interventions on healthcare markets. With the increasing influence of technology in corporate industries, investigating the relationship between innovation, technological advancements and efficiency in the medical scheme market is a promising avenue for future research. Articles such as FinMark Trust (2016) provide a framework for understanding the role of innovation in healthcare markets, which can be applied to the South African context. Comparative analyses with healthcare markets in other countries could provide valuable insights into the uniqueness of the South African medical scheme market. Research such as Ellis et al., (2019), comparing healthcare systems globally, can serve as a guide for such cross-country comparisons.

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APPENDICES

Appendix A: Pre-estimate Econometric Tests for Open Medical Schemes

Table A.1: Multicollinearity for Open Medical Schemes

	VIF	1/VIF
HHI	1.085	.922
LOG MEM	1.047	.955
TECH PROV	1.04	.961
M_FUND	1.005	.995
Mean VIF	1.044	.

Table A.2: Pesaran Abs Cross Sectional Dependence for Open Medical Schemes

Pesaran tes o cross- independen = 46.02 P = 0.000 Average absolute value of the off-diagonal elements

Table A.3: Wooldridge Test for Autocorrelation - Open Medical Schemes

Wooldridge test for autocorrelation in panel data H0: no first-order autocorrelation F(1, 21) = 0.717 Prob > F = 0.4066

Table A.4: Modified Wald Test for Groupwise Heteroskedasticity in Fixed Effect Regression Model – Open Medical Schemes

H0: sigma(i)^2 = sigma^2 for all i chi2 (22) = 29.69
Prob>chi2 = 0.1261

Table A.5: Hausman (1978) Specification Test – Open Medical Schemes

Coef.	
Chi-square test value	2.696
P-value	0.61

Appendix B: Pre-estimate Econometric Tests for Closed Medical Schemes

Table B.1: Multicollinearity for Closed Medical Schemes

	VIF	1/VIF
HHI	3.537	.283
LOG MEM	3.531	.283
M FUND	1.017	.983
TECH PROV	1.014	.987
Mean VIF	2.275	.

Table B.2: Pesaran Abs Cross Sectional Dependence for Closed Medical Schemes

Pesaran's test of cross-sectional independence = 136.194, Pr = 0.0000 Average absolute value of the off-diagonal elements = 0.999

Table B.3: Wooldridge Test for Autocorrelation - Closed Medical Schemes

Wooldridge test for autocorrelation in panel data H0: no first-order autocorrelation F(1, 59) = 1.162 Prob > F = 0.2855

Table B.4: Modified Wald Test for Groupwise Heteroskedasticity in Fixed Effect Regression Model – Closed Medical Schemes

H0: sigma(i)^2 = sigma^2 for all i chi2 (60) = 2.56 Prob>chi2 = 1.0000

Table B.5: Hausman (1978) Specification Test – Closed Medical Schemes

Coef.	
Chi-square test value	0.290
P-value	0.9

Appendix C: Pre-estimate Econometric Tests for All Medical Schemes

Table C.1: Multicollinearity for All Medical Schemes

	VIF	1/VIF
HHI	**1.264**	**.791**
LOG MEM	**1.208**	**.828**
M FUND	**1.053**	**.95**
TECH PROV	**1.032**	**.969**
Mean VIF	**1.139**	**.**

Table C.2: Pesaran Abs Cross Sectional Dependence for All Medical Schemes

Pesaran's test	**of**	**cross-sectional**	**independence**	**=**	**178.930,**	**Pr**	**=**	**0.0000**
Average absolute value of the off-diagonal					**elements**	**=**		**0.971**

Table C.3: Wooldridge Test for Autocorrelation - All Medical Schemes

Wooldridge test for autocorrelation in panel data H0: no first-order autocorrelation

F(1, 81) = 994.813 Prob > F = 0.0000

Table C.4: Modified Wald Test for Groupwise Heteroskedasticity in Fixed Effect Regression Model – All Medical Schemes

H0: sigma(i)^2 = sigma^2 for all i chi2 (82) = 21.57
Prob>chi2 = 1.0000

Table C.5: Hausman (1978) Specification Test – All Medical Schemes

Coef.

Chi-square test value 103.824

P-value 0