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The Determinants of the Profitability of Micro-Life Insurers in Nigeria and South Africa

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**The Determinants of the Profitability of Micro-Life
Insurers in Nigeria and South Africa.**

Olajumoke I. B. Oyekan

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

School of Management

October 2013

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This thesis is dedicated to my late father, Francis Olaosebikan for instilling in me the principles of discipline and hardwork.

Table of Contents

List of Figures	v
List of Tables.....	vi
List of Appendices.....	vii
Acknowledgements.....	viii
Abstract	ix
List of Abbreviations	xi
1. Overview of the Study.....	1
1.1 Introduction.....	1
1.2 Aim and Objectives of the Study	5
1.3 Contributions of the Research	6
1.4 Research Methodology	8
1.5 Assumptions and Scope	9
1.5.1 Assumptions	9
1.5.2 Scope of the Project.....	10
1.6 Outline of the Thesis.....	11
2. Institutional Background	14
2.1 Introduction	14
2.2 Institutional Context.....	14
2.2.1 Nigeria	15
2.2.2 South Africa	26
2.3 Justification of Institutional Context.....	37
2.4 Summary and Conclusion	39
3. Literature Review.....	40
3.2 The Origin of Micro-Insurance	40
3.3 Definition of Micro-Insurance	41

3.3.1 Micro-insurance - Social Protection Perspective	43
3.3.2 Micro-insurance - New market Perspective	45
3.4. Characteristics of Micro-Insurance	47
3.5 Micro-Life Insurance Product Types	49
3.6 Links between Micro-Finance and Micro-Insurance.....	52
3.7 Related Literature	53
3.7.1 Transaction Cost Economics	53
3.7.2 Information Asymmetry.....	55
3.7.2.1 Adverse Selection	56
3.7.2.2 Moral Hazard	57
3.7.2.3 Agency Costs	58
3.7.3 Financial Leverage	63
3.7.4 Reinsurance	65
3.8 Summary and Conclusion	69
4. Hypotheses Development.....	70
4.1 Introduction	70
4.2 Cost Efficiency	70
4.3 Ownership Structure.....	71
4.4 Leverage.....	75
4.5 Reinsurance.....	77
4.6 Interaction Term (Reinsurance x Leverage)	78
4.7 Summary and Conclusion	79
5. Research Design	80
5.1 Introduction	80
5.2 Data Sources and Description	80
5.3 Frontier Efficiency Estimation.....	82
5.3.1 Linear Programming (DEA) Approach	84
5.3.2 Econometric (SFA) Approach.....	87
5.3.3 Input, Input Prices and Outputs.....	91
5.4 Panel Data Design	94
5.5 Model Specification.....	96
5.5.1 Dependent Variable.....	97

5.5.2 Independent Variables.....	97
5.5.3 Control Variables	98
5.6 Econometric Diagnostics	103
5.7 Summary and Conclusion	104
6. Empirical Results	105
6.1 Introduction	105
6.2 Univariate Analysis-Descriptive Statistics	105
6.3 Bivariate-Correlation Analysis	112
6.4 Multivariate Results	117
6.5 Robustness Tests	127
6.6 Summary and Conclusion	130
7. Summary and Conclusions	132
7.1 Introduction	132
7.2 Overview of the Project.....	132
7.3 Research Conclusions and Implications	135
7.4 Contributions of the Research	141
7.5 Research Limitations.....	143
7.6 Areas for Future Research	144
7.7 Final Remarks.....	146
Appendices	148
References.....	157

List of Figures

Figure 2.1: Nigeria: Claims and Expense Ratios for Life Insurers, 2005-2010.....	19
Figure 2.2: Nigeria: Life Insurance Premiums, 2005-2010.....	19
Figure 2.3: Nigeria: Distribution of Life Insurance Business.....	21
Figure 2.4: Nigeria: Potential Distribution Channels for Micro-Insurance. .	21
Figure 2.5: South Africa: Life Insurance Premiums, 2005-2010.	29
Figure 2.6: South Africa: Distribution of Life Insurance Business.....	31
Figure 3.1: Potential Market Estimates for the Global Micro-Insurance Market.	46

List of Tables

Table 2.1: Nigeria and South Africa: Key Economic Indicators.....	35
Table 2.2: Characteristics and Definition of Micro-insurance: Proposed Regulation.	36
Table 3.1: Differences between Micro-Insurance and Conventional Insurance.....	48
Table 6.1: Descriptive Statistics: Nigeria and South African Micro-Life Insurers, 2005-2010.cs: Nigerian and South African Micro-Le Insurers, 2005-2010.....	108
Table 6.2: Pearson and Spearman Correlation Matrix: Nigeria and South African Micro-Life Insurers, 2005-2010.....	114
Table 6.3: Variance Inflation Factors (VIFs)	116
Table 6.4(A): Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation.	118
Table 6.4(B): Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation- including the Interaction term.....	119
Table 6.5(A): Nigeria: Analysis of the Profitability of Micro-Life Insurers; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation.	123
Table 6.5(B): South Africa: Analysis of the Profitability of Micro-Life Insurers; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation..	124

List of Appendices

Appendix A : Comparison of Actual vs. Estimated Expenses of Micro-Life Insurers in Nigeria, 2005-2010.....	148
Appendix B : Definition and Descriptive Statistics of Inputs, Input Prices, and Outputs employed in the Estimation of Cost Efficiency.	149
Appendix C : Definition and Description of Dependent, Independent and Control Variables.	150
Appendix D : Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares(FGLS) Estimation- Using the Technical Efficiency Estimate	153
Appendix E : Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares(FGLS) Estimation- Using the Allocative Efficiency Estimate	154
Appendix F : Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation (Omitting the Regulation variable).	155
Appendix G : Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Pooled Ordinary Least Squares (OLS) Estimation.	156

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Abstract

This thesis examines the factors that influence the profitability of micro-life insurance firms in Nigeria and South Africa. In particular, the joint impact of cost efficiency, ownership structure, leverage and reinsurance together with other institutional factors, on the profitability of commercial micro-life insurance providers are investigated. The cost efficiency estimates are derived using two main frontier efficiency estimation techniques; data envelopment analysis (DEA) and stochastic frontier analysis (SFA) in a first-stage analysis. Furthermore, a panel data feasible generalised least squares (FGLS) estimator, which helps to simultaneously control for the presence of heteroskedasticity and serial correlation in the sample data, is employed to test the research hypotheses. Using the FGLS estimator in a panel of 61 firms over the period covering 2005 and 2010, the study supports as well as contradicts the results of prior studies.

The present study finds that the economic insights derived using either DEA or SFA in the computation of cost efficiency, as well as its components – technical and allocative efficiency- are relatively similar. The empirical results further suggest that cost efficiency which is positively associated with profitability is significant for the business success of micro-life insurers. Furthermore, empirical evidence indicates that the increasing use of leverage helps to improve profitability, while the increasing use of reinsurance reduces profitability. Contrary to expectations, the interaction between reinsurance and leverage decreases the profitability of micro-life insurance firms. The empirical results reveal no statistically significant relation between ownership structure and the profitability of micro-life insurers for all the stock-ownership forms considered. On the other hand, the study finds that firm-specific effects such as the company size, product mix, length of time of operations in the market (age), and macro-economic factors such as the average annual interest rates, are significant drivers of the profitability of micro-life insurers.

The present study contributes potentially valuable insights on the performance of micro-life insurance operations, and its conclusions could be

of interest and relevance to local and multinational insurers and reinsurers, industry regulators and other interested parties such as multinational investors.

List of Abbreviations

AIG	American International Group
AfDB	African Development Bank
ATM	Automated Teller Machine
BoP	Bottom of the Pyramid
CAT	Charges, Access and Terms
CENFRI	Centre for Financial Regulation and Inclusion
CEO	Chief Executive Officer
CIIN	Chartered Insurance Institute of Nigeria
CRS	Constant Returns to Scale
CSR	Corporate Social Responsibility
DEA	Data Envelopment Analysis
DMU	Decision Making Unit
FAIS	Financial Advisory and Intermediary Services
FE	Fixed Effects
FGLS	Feasible Generalised Least Square
FSB	Financial Services Board (South Africa)
FSC	Financial Sector Charter
GDP	Gross Domestic Product
IAIS	International Association of Insurance Supervisors
IIS	International insurance Society
ILO	International Labour Organization
IMF	International Monetary Fund
IRDA	Insurance Regulatory Development Authority (India)
LOA	Life Offices Association
LSM	Living Standards Measure
MDRI	Market Development and Restructuring Initiative
MFI	Micro-Finance Institution
MSCI EM	Morgan Stanley Capital international-Emerging Markets

NAICOM	National Insurance Commission (Nigeria)
NIA	Nigerian Insurers' Association
NICON	National Insurance Corporation of Nigeria
OAU	Organization of African Unity
OLS	Ordinary Least Squares
OPEC	Organization of the Petroleum Exporting Countries
RGA	Reinsurance Group of America
ROA	Return on Assets
SFA	Stochastic Frontier Analysis
TCE	Transaction Cost Economics
UK	United Kingdom
US	United States
VRS	Variable Returns to Scale

Chapter 1

Overview of the Study

1.1 Introduction

Insurance plays a significant role in the development of emerging economies (Outreville, 1990). Han, Li, Moshirian, and Tian (2010) in their study of the relation between insurance development and national economic growth, contend that both life and non-life insurance play a relatively more important economic function in developing countries than they do in more developed parts of the world. However, formal insurance services are out of reach for millions of low income individuals (especially in developing countries) who are often the most at risk and least able to protect themselves during periods of economic shocks or crisis (Churchill, 2002, 2006a, 2006b, 2007). Insurance for low income groups in developing countries (so-called 'micro-insurance')¹ has been identified as a means by which the poor could access financial services to help mitigate losses resulting from unforeseen events such as the death of a family member, illness, and loss of income or property (Bester, Chamberlin, & Hougard, 2009).

Micro-insurance is a risk protection mechanism for low income² groups and an integral part of the growing international micro-finance industry that emerged in the 1970s (Churchill, 2007). Although the concept of micro-insurance has been in existence for several decades (e.g. see Chapter 3, section 3.2), it is only in the past few years that it has come to be understood as a distinct line of business - with its own commercial potential as well as challenges. The micro-insurance industry has attracted

¹Micro-insurance can be generally defined as the protection of low-income groups against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of risk involved (Churchill, 2007) - see chapter 3, section 3.3 for other operational definitions.

²Swiss Re (2010) defines low income groups as households who subsist on incomes of US\$4 or less per day. Because of their limited private collateral, people living in poverty are clearly vulnerable to unanticipated life cycle risks such as death and disability (Churchill, 2007).

considerable interest from various stakeholders such as the international (re)insurance industry, economic development organisations, charitable bodies, and regulators, because like its progenitor, micro-credit, it has been viewed not just as a tool for poverty alleviation but also as a viable business and economic development strategy for low income developing countries (Koven & Zimmerman, 2011). The market potential for micro-insurance is estimated to be up to 3 billion policies globally with annual growth rates at 10% or higher (Lloyd's of London, 2009). In addition, the prospective in-force business value of the micro-insurance market is estimated to be up to US\$40 billion (Swiss Re, 2010).

Profitability has long been recognized to be a key operational and strategic objective for the contracting constituents of insurance firms and various external stakeholders (e.g., see Doherty & Garven, 1986; Grace & Hotchkiss, 1995; Haley, 1995). Indeed, the achievement of sustained operational profitability is the main strategic objective of most local and international commercial insurance companies in the micro-insurance market who are seeking new growth opportunities away from saturated traditional insurance markets. Despite its huge market potential, the viability of many micro-insurance schemes is still being questioned and not surprisingly so, given the low premiums, high administrative costs and poor levels of insurance infrastructure in developing countries (e.g., see Churchill, 2007; Cohen & Sebstad, 2005). In particular, because micro-insurance is by design a low-premium product, the proportion of the premium that must go to pay for expenses (as opposed to payment for covered losses) is higher than in conventional insurance. This type of situation promotes adverse selection; therefore, any ability of the insurer to reduce per-policy costs is likely to yield great returns for ultimate operational sustainability and profitability.

Prior reports and studies (e.g., Churchill, 2002, 2006a, 2006b, 2007; McCord, Steinman, & Ingram, 2012; Olaosebikan & Adams, 2013; Roth, McCord, & Liber, 2007) examine the key features of micro-insurance markets, and highlight the demand and supply-side factors affecting the business success and increased take-up of micro-insurance in developing countries. Some of the key issues include regulatory constraints, cost effective distribution

channels, risk assessment and pricing, market demand, consumer education, and role of reinsurers in capacity building. Churchill (2007) contends that regulation plays an important role in the effective supply of micro-insurance. However, imposing regulatory schemes of traditional markets or inadequate regulation could inhibit the growth of micro-insurance. Furthermore, Swiss Re (2010) reports that the identification and development of a cost-effective distribution model is crucial to the long-term success and sustainability of micro-insurance given the high administrative and operating costs involved in “reaching” the low income markets. Churchill (2006a) contends that profitability has been particularly difficult to achieve for voluntary micro-insurance products, and highlights the importance of flexibility in product design to develop products which cater not only to the poor, but also to slightly higher income groups. Roth and Athreye (2005) argue that risk management issues such as adverse selection, moral hazard, and covariant risks are factors which have impeded the business success of micro-insurance. These issues arise especially due to the lack of quality data which makes it challenging for micro-insurance providers to effectively assess and price risk. Thus, the bid to strike a balance between affordability and profitability results in the development of products that provide narrow coverage and limited benefits.

Furthermore, McCord et al. (2012) emphasise the importance of reinsurance in providing risk capacity and technical expertise in the low income market. They contend that most micro-insurers are operating at a small to medium scale especially in Sub-Saharan Africa due to lack of risk capital and limited access to cost-effective reinsurance and technical expertise. However, McCord, Bolero, and McCord (2005) argue that reinsurance is necessary for providing risk-spreading capacity. However, the regulatory and/or commercial requirement to hold ‘costly’ reinsurance could have a negative impact on profitability. Giesbert, Steiner, and Bendig (2011) investigated the household demand for a micro-life insurance product (the so-called *Anidaso* (‘Hope’)) policy provided by the Gemini Life Insurance Company (GLICO) to 350 households in Ghana. They found that consumer demand was directly motivated by the risk status of the insured (suggesting adverse selection issues), life-cycle (age) effects, educational levels, residence in the capital

city (where there may be better product information), and the existence of formal precautionary savings (which appear to reinforce rather than substitute for the demand for micro-insurance suggesting that issues such as financial literacy are likely to be important determinants of demand). Angove and Tande (2011) in a case-study of the profitability of commercial micro-insurance providers, highlight the achievement of scale economies, reduction of acquisition and administrative costs, and claims costs as the main drivers of profitability. They demonstrate that the achievement of sustainable profitability is often an iterative process of continuously learning from the market, and making adjustments to the design and pricing of products.

Despite the growing literature on micro-insurance, broader quantitative studies on the profitability of micro-insurance remain limited. The dearth of research on the financial performance of micro-insurance schemes has been largely attributed to lack of publicly available data as most micro-insurance providers do not distinguish micro-insurance data from that of conventional insurance business (Wipf & Garand, 2010). Biener and Eling (2011) were the first researchers to quantitatively examine the efficiency of micro-insurance programmes. Using data from 21 micro-insurance schemes provided by the Performance Indicators Working Group of the Micro-insurance Network, they considered financial performance from both the quantitative and social perspective, and suggest significant improvement potential in terms of the productivity and efficiency of the micro-insurance programs examined. The present study differs from that of Biener and Eling (2011) in that it focuses on commercial (formal) micro-life insurance providers, and also because a much larger proportion of micro-life insurers from two sub-Saharan African significant markets (i.e., Nigeria and South Africa) are analysed.

Therefore, the present study seeks to address the gap in the literature by using panel data (2005-2010) drawn from the Nigerian and South African micro-life insurance industries to examine the quantitative factors that drive the business success and sustainable profitability of commercial micro-life insurance providers. Specifically, the two main research questions that will be investigated in this study are:

Research Question 1: Can micro-life insurance be profitable for commercial insurance providers?

Research Question 2: What are the specific quantitative factors that drive the business success and sustained profitability of commercial micro-life insurance providers?

1.2 Aim and Objectives of the Study

As noted above, the purpose of the present research project is to examine some of the quantitative factors that influence the profitability of micro-life insurers in Nigeria and South Africa. To achieve this aim, the study has four distinct objectives:

1. To provide background information on the physical, economic, and regulatory environments within which micro-life insurers in Nigeria and South Africa operate, and also to compare the differences in the institutional environment between the two countries.
2. To identify an appropriate theoretical framework by means of an extensive review of the micro-insurance, risk management, and financial economics literature so as to identify the possible factors that could influence financial profitability.
3. To develop and empirically test hypotheses drawn from the selected theoretical framework by means of various statistical techniques such as univariate and multivariate analysis.
4. To evaluate and discuss the empirical results, outline the key directions for future research, and elucidate the commercial and public policy implications of the study.

1.3 Contributions of the Research

The study should contribute to the existing body of literature in at least six principal regards as follows:

1. Compared to prior studies (e.g., Biener & Eling, 2011), the present study uses a much larger dataset from Nigeria and South Africa, the two largest economies of sub-Saharan Africa, to examine the quantitative factors that drive the profitability/ business success of micro-life insurance firms (see chapter 5, section 5.2). The cross-country analysis could further contribute new insights and highlight lessons that could be applied by micro-life insurance providers, particularly in Nigeria which has a much lower rate of insurance penetration than South Africa.
2. The present study could help improve the understanding of the mechanics of successful mortality risk assessment and pricing in emerging markets. In particular, the study could provide insights on the key quantitative factors that drive the business success of micro-insurance providers operating not only in sub-Saharan Africa but also in other parts of the developing world that have similar social and economic characteristics (e.g., Latin America and the Caribbean). This aspect of the research project could also enable multinational financial institutions and others (e.g., business consultants) to make more informed strategic decisions in emerging markets (e.g., with regard to prospective joint-ventures and acquisitions).
3. Biener and Eling (2011) observe that large non-profit organizations which have been active in micro-insurance markets for longer periods are inefficient. Thus, empirical evidence linking period profitability to firm-specific factors, such as ownership structure, financial structure, amount of reinsurance, firm size, and so on, could better inform policyholders and shareholders as to whether a micro-life insurance provider is likely to be able to meet its contractual obligations. Such an insight could also enable prospective customers

and capital suppliers to make better insurance and investment decisions.

4. The present study could provide new information about the persistency of business-in-force and so have potentially important commercial and public policy implications. For example, evidence indicating an inverse relation between the size of micro-life insurance firms and their profitability could suggest to industry regulators that the solvency position of smaller entities should be subject to closer scrutiny than that of larger operatives. Indeed, Kwon (2010) argues that governments need to more tightly regulate micro-insurance markets and invest in legal and financial infra-structure as a precursor to future growth and development.
5. The focus of the present study is on the micro-life insurance market in Nigeria and South Africa. Lloyd's of London (2009) report that life insurance is the predominant line of micro-insurance business in developing countries. Biener (2013) contend that life insurance products are generally easy to provide relative to other business lines and more compliant with the fundamentals of insurability. For example, life insurance claims are easily verifiable using a death certificate (see section 1.5.2). Therefore, the analysis of the salient factors that influence the profitability of micro-life insurers could provide the opportunity to transfer successful approaches from micro-life insurance to other lines of micro-insurance business (e.g., agricultural insurance) which have low take-up rates.
6. Prior studies (e.g., Cummins & Weiss, 2000) report that Data Envelopment Analysis (DEA) and the Stochastic Frontier Analysis (SFA) are the two main approaches employed in frontier efficiency estimation (see Chapter 5, section 5.3). Furthermore, Eling and Luhnen (2010a) contend that inherent relative advantages and disadvantages with these two main approaches make it difficult to determine the most superior frontier estimation technique (again

see chapter 5, section 5.3). Unlike prior studies (e.g., Choi & Weiss, 2005; Greene & Segal, 2004) which employ only one estimation technique, the present study uses both the DEA and SFA frontier estimation techniques in the computation of the cost efficiency scores in the first stage of regression analysis. The use of the two frontier estimation approaches helps distinguish the effects of the chosen estimation method on the cost efficiency estimates derived, and also enable a more effective comparison of the main results than otherwise would be the case.

1.4 Research Methodology

To address the research questions, and achieve the stated aim and objectives of the research project, a combination of literature-based and empirical research methods are employed as follows:

1. A search and analysis of the relevant literature leading to the selection of an appropriate theoretical framework to guide empirical analysis.
2. A statistical analysis of panel data for the period 2005-2010, using data from published sources such as the annual reports and accounts provided by the insurance regulator in the two countries. For Nigeria, annual data are compiled by the Nigerian Insurance Association (NIA) and submitted to the insurance industry regulator – the National Insurance Commission (NIACOM). For South Africa, annual data are filed with the local insurance industry regulator – the Financial Services Board (FSB). In situations where data on micro-life insurance business are unavailable from published sources, the required data are obtained directly from internal company sources through authorized direct access and/or by interview with senior technical managers³.

³For Nigeria, data access was also provided by insurance board-level executives, who were members of the International Insurance Society (IIS), while the Reinsurance Group of America (RGA) Cape Town, through its clients, provided data access for South Africa.

3. The sample data is analysed using various statistical techniques, such as the frontier efficiency estimation techniques (i.e., DEA and SFA) in a first-stage analysis, and the feasible generalised least squares (FGLS) estimation technique in the second-stage⁴.

1.5 Assumptions and Scope

1.5.1 Assumptions

The study is predicated on four main assumptions as follows:

1. The managers of micro-life insurance companies in Nigeria and South Africa have the discretion to make decisions that maximize profits independently of industry regulators and other external constituents – for example, in terms of restrictions on premium rates that can be levied. This assumption is deemed to be reasonable given the often cited limited regulatory structures on premium rates in emerging markets (e.g., Zou, Adams, & Buckle, 2003).
2. Profitability represents the main source of financial strength and condition of micro-life insurance companies given the limited scope of such companies (e.g., due to limited investment opportunities and asset management expertise) to diversify their investments and optimize risks and returns on retained assets (Swiss Re, 2012).
3. In cases where it is difficult to assess the cost of micro-insurance business directly, assumptions are made around expense allocation. The expenses are allocated based on a 'proportionate method' in which management costs were allocated to the micro-insurance business based on premium volumes (e.g., see Angove & Tande, 2011)

⁴The frontier efficiency estimation techniques are described in section 5.3 and the rationale for employing FGLS estimation in the current study are described in chapter 5, section 5.7.

4. The data to be analysed are obtained from independently audited annual financial statement and reports submitted by the insurance companies to the insurance industry regulator – NIACOM for Nigeria, and the FSB for South Africa. Additional data obtained from internal company sources are also subject to independent audit review. Therefore, the data to be used in this study are assumed to be reliable.

1.5.2 Scope of the Project

The scope of the project is defined in four key regards:

1. The study focuses on commercial micro-life insurance companies in Nigeria and South Africa directly writing low premium, low coverage term life insurance⁵ in three main business lines: savings-linked, credit-life, and funeral insurance.
2. The study focuses on micro-life insurance because in contrast to non-life insurance policies (e.g., on crops, property, and health), life insurance is the predominant line of micro-insurance business in developing countries accounting for approximately 30% of policies sold as it is driven largely by the lending activities of micro-finance institutions (Lloyd's of London, 2009). Furthermore, Biener and Eling (2012) contend life insurance products are more compliant with the fundamentals of insurability and are thus generally easy to provide relative to other business lines. Life insurance policies have traditionally been more predictable because of the ease of the application of actuarial technology in determining premium levels and

⁵ Short-term life insurance is relatively easy to actuarially price and risk-manage compared with longer term life insurance products and pensions. For this reason, standard term life insurance products are more commonly offered by micro-life insurance companies in emerging markets, particularly to cover funeral expenses, and protect assets that provide lenders (micro-finance banks) with the collateral for granting personal and small business loans (i.e., so-called credit-life micro-insurance). Indeed, compared with other micro-insurance products, life insurance currently has the largest coverage and rate of take-up in developing countries (Roth et al., 2007). This is because the life of the main 'bread-winner' is often the main productive asset in family units and village communities in emerging economies (Jacobsen, 2009).

valuing liabilities. In addition, claims validation is relatively easy in life insurance, because the event that triggers coverage is death which is a fairly transparent and inevitable occurrence (Roth et al., 2007). In contrast, the underwriting performance of non-life micro-insurance companies is likely to be at greater risk of information asymmetry (i.e., adverse selection and moral hazard) problems and administrative difficulties (e.g., the difficulty of implementing effective fraud controls) thereby increasing business operating costs. This means that in theory, micro-insurance managers operating in the life insurance sector should be able to better manage their underwriting and administrative functions (e.g., minimize insurance fraud) and therefore maximize corporate profitability. These attributes of micro-life insurance allows 'potentially' cleaner tests of the research hypotheses to be carried out.

3. The present study examines only commercial stock micro-life insurance providers in Nigeria and South Africa. This is due to the lack of publicly accessible data for other entities or ownership forms such as mutual companies, local co-operative groups, and burial/friendly societies.
4. The proposed time span of the study covers 6 years; 2005-2010. The year 2005 is the earliest accounting period for which accurate data on micro-life insurance were available from public sources, while the latest year covered by the dataset that enables the analysis to be conducted in a timely manner is 2010.

1.6 Outline of the Thesis

This chapter has introduced the background of the research project and specified the aims, objectives, motivation and scope of the study as well as the key assumptions underpinning the research. This section presents an outline of the remaining chapters of the thesis as follows:

Chapter 2: Institutional Background. This chapter provides information on the institutional environment in which Nigerian and South African micro-life insurance companies operate. Specifically, the chapter gives an overview of the economic and physical landscape of Nigeria and South Africa. The chapter also outlines the salient features of the local micro-life insurance markets as well as the proposed regulatory environment for micro-insurance. Furthermore, the advantages of conducting an empirical study on the determinants of the profitability of micro-life insurers in Nigeria and South Africa are put forward in this chapter of the thesis.

Chapter 3: Literature Review. This chapter introduces the theoretical and empirical literature relating to micro-insurance and the determinants of financial performance. In particular, the chapter describes the origin, definition and perspectives of micro-insurance, the micro-life insurance product-types, and the differences between micro-insurance and conventional insurance. Furthermore, the chapter examines prior research relating to financial performance of insurance firms, such as the literature on transaction costs, information asymmetries and agency problems. The insights drawn from the review of literature are then used to develop the research hypotheses put forward in Chapter 4.

Chapter 4: Hypotheses Development. This chapter summarises the key insights from the literature reviewed in chapter 3, and explains the rationale for the selection of the four main hypotheses that helps to address the research questions of the study, and direct the empirical testing conducted in chapter 6.

Chapter 5: Research Design. This chapter discusses the rationale for the statistical analytical techniques employed in the study. Specifically, the sources of data, the definition of main variables, and the econometric model employed to test the research hypotheses are described in this chapter of the thesis.

Chapter 6: Empirical Results. This chapter presents the results of the statistical analysis of the sample of Nigerian and South African micro-life insurers over the period 2005-2010. Specifically, the key aggregate features of the variables are described using the summary statistics (i.e., the mean,

median, standard deviation, minimum and maximum range, and number of observations). In addition, the Pearson/Spearman correlation analysis is also conducted to test the strength of the association between pairs of each variable. The FGLS estimation technique is further employed to determine the simultaneous effects of the explanatory variables on financial profitability while controlling for time-effects and firm-specific effects. Finally, robustness tests are conducted using several statistical techniques to ascertain the validity of the results obtained.

Chapter 7: Summary and Conclusions. This chapter summarises the research project and draws conclusions from the empirical analysis. The contributions of the study, and in particular, the potential commercial and public policy implications are assessed. Furthermore, the inherent limitations of the study as well as the opportunities for future academic research are identified and discussed.

Chapter 2

Institutional Background

2.1 Introduction

This chapter provides information on the institutional environment within which commercial micro-life insurance providers in Nigeria and South Africa operate. Specifically, the chapter provides an overview of the institutional context in terms of the physical and economic landscape, nature of the micro-life insurance market, and the regulatory environment for each of the sample countries examined. In addition, the advantages of conducting an empirical study on the determinants of the profitability of micro-life insurance providers in Nigeria and South Africa are put forward in this chapter.

2.2 Institutional Context

Swiss Re (2010) reports that with approximately 600 million persons living on less than US\$ 4 per day (about 20% of the world's poor) sub-Saharan African countries would benefit significantly from micro-insurance initiatives. The report acknowledges that between 2006 and 2008 micro-life insurance in sub-Saharan Africa registered about 80% increase in covered lives with currently around 15 million policies in-force generating premium income of roughly US\$257 million. Despite the increasing profile and economic importance of micro-insurance in sub-Saharan Africa, McCord et al. (2012) in a recent study show that micro-life insurance grew from about 15 million policies in 2008 to approximately 44 million policies in 2011. However, most of the growth came from South Africa, with just nine African countries accounting for over 90% of this take-up in micro-insurance coverage. On the positive side, there have been some important developments and innovations in the micro-insurance sector. For example, new micro-insurance

products tailored to the basic needs of low income people have successfully entered the market while educational initiatives by international financial institutions and other organizations have helped increase consumer awareness of micro-insurance in developing countries. Recent initiatives have also recognized the need to adapt regulation and infra-structure to facilitate the projected expansion of micro-insurance in the developing world (Churchill & Matul, 2012). The micro-insurance market still faces major institutional and economic challenges which have so far impeded the sector's growth and raised questions as to its longer term sustainability. The general consensus from previous studies (e.g., Matul, McCord, Phily, & Harms, 2010) is that the long term success of micro-insurance is dependent on innovative supply chain strategies at the level of the insurance carrier (e.g., in terms of product development, distribution, coverage, policy administration and claims settlement) and infrastructural developments at the institutional environment level (e.g., supportive regulation and property rights legislation). The present study utilizes micro-life insurance data from two major sub-Saharan African countries - Nigeria and South Africa. The institutional contexts of each country are examined below.

2.2.1 Nigeria

Physical and Economic Landscape:

Nigeria, an Anglophone country in West Africa with a geographical area of approximately 351,785 square miles, and current population of approximately 159 million people, is the most populous nation in Sub-Sahara Africa (accounting for approximately 81% of the region's people) with around 51 percent of the total population living in urban areas (World Bank, 2012a). The population comprises over 250 ethnic groups with Hausa, Igbo and Yoruba as the three main languages, and English as the official language. Nigeria is nearly equally divided between Muslims (50%) and Christians (48.2%), with the majority of Muslims mainly concentrated in the northern part of the country, while the Christians dominate the Middle-belt and Southern areas (Central Intelligence Agency, 2013). Nigeria's main economic

activity is in agriculture and extractive industries such as mining, and oil and gas production (World Bank, 2012a). Nigeria, which is a member of the Organisation for Petroleum Exporting Countries (OPEC), is the world's eighth largest oil producer, sixth largest oil exporter, and has the world's sixth largest deposits of natural gas (International Monetary Fund, 2013). According to the World Bank (2012a) figures, the gross domestic product (GDP) is US\$ 228 billion with an annual GDP growth of about 8%, making it the second largest economy in sub-Saharan Africa after the South Africa. Despite recent economic growth, widespread poverty is still a major problem in Nigeria as approximately 85% of the population live on less than US\$2 per day, with gini coefficient of 0.48⁶. In addition, the World Bank (2012a) ranks Nigeria as a lower middle income country because the country is characterised by a thriving oil economy and high-income elite on the one hand, but with persistent poverty and rudimentary socio-economic development on the other hand.

Micro-Life Insurance Market:

Insurance in Nigeria can be traced back to the colonial era of the nineteenth century with the growth of commercial activities (e.g., shipping and banking) associated with the expansion of the British Empire (Osoka, 1992). By 1976, there were about 70 insurance providers in Nigeria consisting of 14 foreign-owned and 56 indigenous companies. However, at this time most insurable risks were underwritten by foreign insurance companies, accounting for about 53% of total gross premiums while indigenous insurers accounted for only about 17% due to their limited underwriting capacity (Chibuike & Chikeleze, 2001). Since the late 1970s, new laws and regulations have been introduced by the Nigerian government over the last two decades or so to encourage local ownership of insurance companies (Osoka, 1992). As a result, today domestic investors hold approximately 60% of the shareholdings of insurers operating in Nigeria. Government intervention in the local insurance market also led to the growth of solely-owned indigenous

⁶ The gini coefficient is a measure of income disparity. The greater the coefficient is to 1, the greater the income variation between the rich and poor.

insurance firms. In 2005, following reforms of the Banking sector, Nigeria's Federal Government along with insurance regulator, NAICOM began a process of overhauling the Nigerian insurance industry (Obaremi, 2007). The main objectives of the new reforms were:

- To increase the low retention capacity of the industry that had stunted growth and expansion.
- To conduct a consolidation exercise in order to produce companies capable of meeting claims obligations, and compete at the global level.
- To attract foreign capital into the industry for enhanced premium growth and profitability.
- To encourage the industry to realise synergies from mergers and acquisitions, in order to achieve superior product innovation, deeper market penetration and product distribution.

Under the new reforms, new capital requirements were stipulated for insurance underwriters. The required minimum capital for life insurers was increased from N150 million (USD\$0.96 million) to N2 billion (USD\$12.76 million), and composite insurers were required to operate life and non-life business segments as separate entities (Obaremi, 2007). The bid to meet the new guidelines resulted in a spate of mergers and acquisitions in the industry leading to a reduction in the number of firms from 104 to 71 post-consolidation, consisting of 43 non-life insurance underwriters, and 26 life insurers. The consolidation exercise also boosted the industry's capitalisation from N30 billion (USD\$192 million) to N200 billion (USD\$1.28 billion) (Obaremi, 2007). Despite the strengthening of the financial capacity of insurance firms due to the reforms in the industry, diminutive growth has been achieved post-consolidation. The insurance sector still only contributes approximately 0.72 percent to GDP, which is much lower than the African average of 3 percent and global average of 7 percent (Swiss Re, 2010). The poor performance of the insurance industry has been attributed to the flurry of mergers and acquisitions which were conducted with minimal due diligence, and the failure to address the core persistent (and historical) issues such as poorly developed distribution systems, poor public

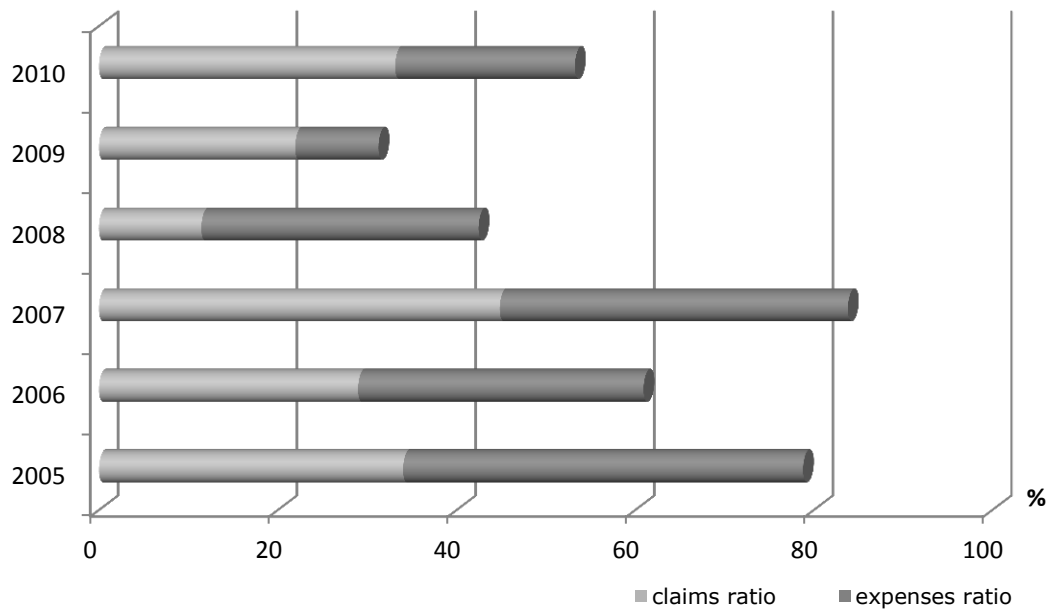
perception/trust, lack of innovation in product development, and inability to attract and retain skill talent amongst others (Afrinvest West Africa, 2008).

The Nigerian life insurance industry is currently made up of 26 firms, consisting of 8 specialised and 18 composite insurers. The penetration of life insurance is quite low and accounts for only 16 percent of total industry premiums. The low insurance penetration rates have been attributed to a lack of trust in the industry (Obaremi, 2007). Management and marketing expenses are disproportionately high and, well exceed the claims ratio which results in low value for consumers - see Figure 2.1. The share of life insurance premiums as a proportion of total new business is, however increasing. Indeed, premiums increased by about 70 percent between 2005 and 2010 (see Figure 2.2), driven largely by the introduction of compulsory insurance such as company group life policies⁷, as well as increased competition from commercial banks (bancassurers). On the other hand, the retail segment of the insurance industry has been relatively slow to innovate to meet the challenges of expanding into the low income segment. Despite the steady growth in incomes across the working population, only about 1million out of the estimated 20million people in formal or informal employment hold personal insurance policies (Afrinvest West Africa, 2008).

Nonetheless, despite the low level of insurance penetration in Nigeria, micro-insurance is not a new concept. For example, in the 1980s, Nigerian insurers began to promote micro-insurance-type products known as 'industrial insurance' (or *esusu*) to low income groups. However, such products were often unsustainable due to difficulties associated with premium collection, lack of reliable systems of claims management, low rates of renewal, and a generally-held public mistrust of the value of insurance (Omar, 2007). The new wave of micro-insurance products is geared towards providing more value for customers through leveraging on technology to improve the payments system as well as the increasing use of the mobile phone network platform.

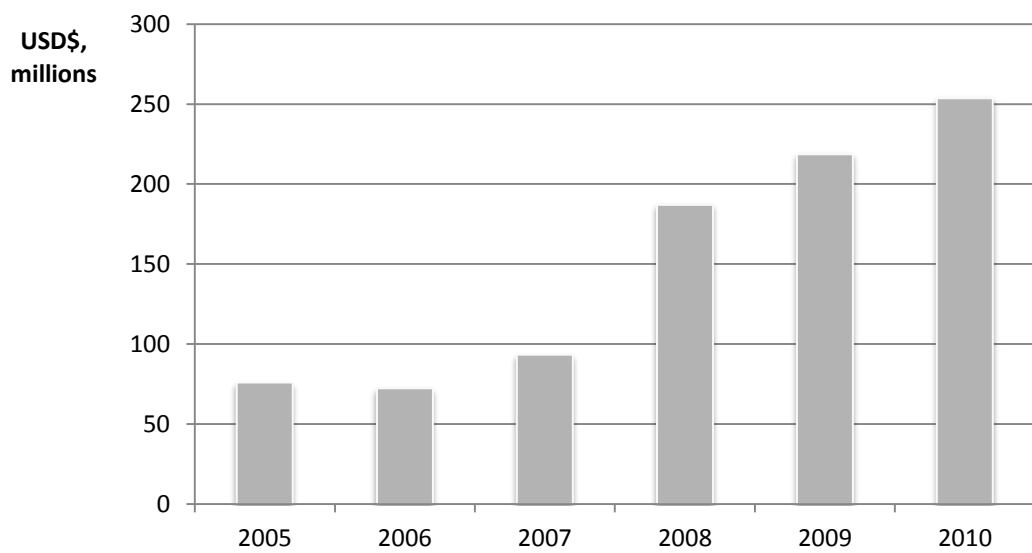
⁷ The Pension Reform Act (2004) stipulates compulsory group life policies for companies, in which employers with five or more employees are required to take out a Life policy for each employee of up to about three times the total annual remuneration of the employee.

Figure 2.1: Nigeria: Claims and Expense Ratios for Life Insurers, 2005-2010.



Source: Nigerian Insurers Association (2011)

Figure 2.2 : Nigeria: Life Insurance Premiums, 2005-2010.



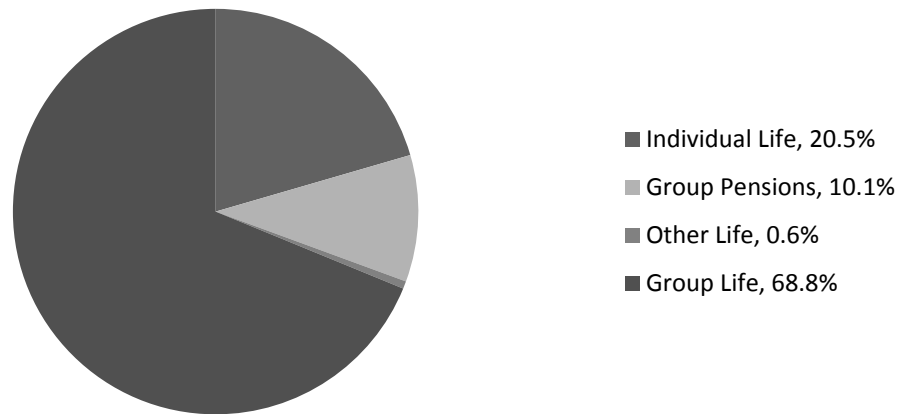
Source: Nigerian Insurers Association (2011)

The most popular micro-life insurance product is savings-linked policies, followed by compulsory credit life, and funeral insurance which is the least demanded (Churchill & Matul, 2012). Savings-linked (endowment) policies are the most common micro-life insurance product offered by formal insurers due to the strong savings culture, and a preference among the low income population for financial products that provide some payout regardless of whether a risk event occurs. Indeed, De Vos, Hougaard, and Smith (2011) report that approximately 62% of Nigerian adults save in some way, with informal associations being the most effective and trusted entities accounting for about 25%, village associations account for about 12.6% while approximately 45% save in their homes. Furthermore, most micro-finance institutions (MFIs) provide compulsory credit life policies on the back of micro-loans to cover the risk of the death or default of the main borrower. There is a limited take up of funeral insurance especially among low income groups because compared to other countries in sub-Saharan Africa (e.g., South Africa), the culture of a dignified (costly) funeral is not prevalent. Indeed, the social taboo of “planning for your own funeral” along with the relatively high Muslim population⁸ in Nigeria, means that individuals rely on family members to provide a decent (not necessarily costly) funeral. There is currently no regulation for micro-insurance in Nigeria, thus insurers are not required to separately report their micro-insurance business. However, micro-insurance business/products are included in the individual life business segment which accounts for about 20.5 percent of Life insurance business in Nigeria (see Figure 2.3).

The distribution of commercial micro-life products in Nigeria is mainly through individual agents and/or brokers, and also through micro-finance institutions (MFIs). The distribution channels are dominated by insurance brokers who control a significant portion of both the life and non-life business segments. Currently, the Nigerian insurance industry consists of 577 registered insurance brokers, 1,900 insurance agents and about 870 MFIs (Nigerian Insurers Association, 2011).

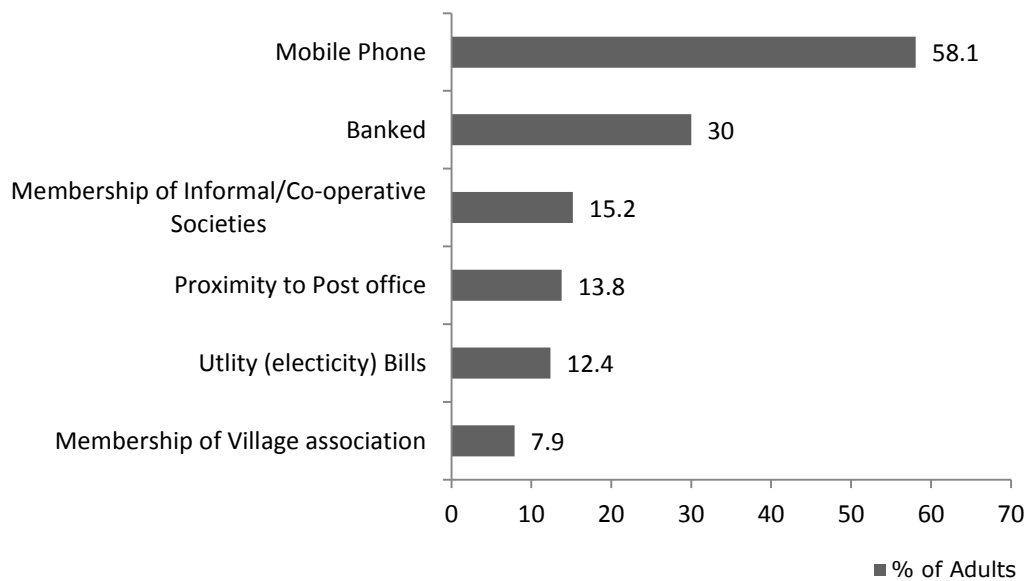
⁸ Life insurance is often deemed by many Muslims to be inconsistent with Islamic principles – for example, it could be viewed as ‘gambling on life’ (Abdul Kader, Adams, & Hardwick, 2010).

Figure 2.3 : Nigeria: Distribution of Life Insurance Business.



Source: International Monetary Fund (2013).

Figure 2.4 : Nigeria: Potential Distribution Channels for Micro-Insurance.



Source: De Vos et al. (2011).

However, given low premiums and high transaction costs, micro-insurance providers are increasingly establishing partnerships with alternative distribution channels in order to achieve the scale required for profitability⁹. De Vos et al. (2011) in a survey of Nigerian adults highlighted the potential channels for micro-insurance distribution. The use of mobile phone network either as a direct and/or alternative distribution channel is a potential powerful tool which could enable micro-insurance achieve the requires scale for profitability given that approximately 60 percent of adults own a mobile phone (see Figure 2.4). In addition, the mobile phone network could serve as a platform for the collection of premiums, especially in Nigeria which has inefficient and ineffective payment systems. Furthermore, existing platforms such as commercial banks and post offices could serve as potential distribution channels (De Vos et al., 2011). The World Bank (2012a) reports that there are about seven commercial bank branches and 11 automated teller machines (ATMs) per 100,000 adult. As shown in Figure 2.4, 30 percent of the adult population has a bank account, while nearly 14 percent of people live near a post office. Figure 2.4 further reveals that approximately 12.4 percent of Nigerian adults receive electricity bills, thus the client-base of utility companies could also as potential targets for micro-insurance providers. Finally, the aggregation of co-operative societies and village associations could also be explored by micro-insurance providers as potential channels for reaching low-income groups (De Vos et al., 2011).

Regulatory Landscape

Insurance in Nigeria is primarily regulated and supervised by the NAICOM under two Acts. The Insurance Act, No. 1 (2003) governs the licensing and operation of insurers, reinsurers and providers of related services while the National Insurance Commission Decree, No. 1 (1997) established the National Insurance Commission as the supervisory institution with the power of inspection, remedial and enforcement actions, and composition of fines

⁹ Alternative distribution channels are institutions which are traditionally not involved in insurance but have a large footprint and reputation in low income markets. Examples include: savings co-operatives, mobile network operators, utility companies and supermarket chains (Smith, Chamberlin, Houggard, Smit, & Carlman, 2010).

(International Monetary Fund, 2013). With the exception of the two government-owned entities, National Insurance Corporation of Nigeria (NICON) and the Nigerian Reinsurance Corporation (Nigeria Re), only firms incorporated as a limited liability company under the Companies and Allied Matters Act (1990), are allowed to register as insurers. That is, there are no mutual or co-operative commercial insurance providers. Prudential regulation stipulates a minimum upfront capital of N2 billion (USD\$12.76 million) for life insurance firms, and N5 billion (USD\$31.9 million) for composite insurers. The minimum capital requirements for insurance firms in Nigeria are relatively high compared to other developing countries, and above the range (US\$4-10 million) required for insurers operating in countries under the Solvency I regime. Furthermore, Nigerian insurance regulation stipulates that no more than 40 percent of the issued share capital of an insurer may be foreign owned (International Monetary Fund, 2013).

The regulation of reinsurance in Nigeria has been largely influenced by market development considerations. The history of reinsurance of risks in Nigeria is closely linked with the development of the insurance industry (Chibuike & Chikeleze, 2001). In 1976, following a recommendation of the African Development Bank (AfDB), the African Reinsurance Corporation (African Re) was established in Yaoundé, Cameroon. The representatives of the 36 member states of the Organisation of African Unity (OAU) and the AfDB signed an international agreement to cede a minimum of 5 percent of risks with African Re, with the aim of reducing the outflow of foreign exchange from the continent (Insurance Act No.1, 2003). This was followed by the Nigeria Reinsurance Decree of 1977, which saw the establishment of Nigeria Re by the government as part of efforts to retain reinsurance premiums locally and reduce the outflow of insurance funds. Under the decree, insurers were required to compulsorily cede 20 percent of their business to Nigeria Re. In addition, Nigeria Re had the right of first refusal on the remaining 80 percent before such businesses could be placed with other indigenous and/or foreign reinsurance companies. The decree has however since been repealed, following the industry reforms in 2005, which saw the privatisation of Nigeria Re, with government retaining a 49 percent stake (Chibuike & Chikeleze, 2001). Therefore, current insurance regulation

stipulates only the 5 percent mandatory legal cession to African Re. Furthermore, reinsurance with foreign firms is subject to the approval of NAICOM, in which insurance firms have to demonstrate that local reinsurance capacity has been exhausted. Foreign reinsurers are required to have a minimum financial strength rating of A- (Standard and Poor's) or A (A.M. Best). Direct insurers are required to retain at least 5 percent of the risks to discourage 'fronting of business', while 100 percent of life insurance business risks are required to be retained in Nigeria (Insurance Act, 2003). The restriction on the placement of reinsurance with foreign reinsurers is a major factor in the slow development of the insurance industry (and in particular the life business segment) in Nigeria, as knowledge transfer opportunities provided by foreign reinsurers in terms of product development, and technical expertise cannot be overemphasised (International Monetary Fund, 2013).

The Insurance Act 2003 permits composite insurance firms to operate in Nigeria. However, the life and non-life business segments must be operated as separate entities under different capital requirements. The Insurance Act 2003 defines individual life, group life and pensions, and health insurance as the three categories of life insurance business. The introduction of new products into any class or category of insurance business is subject to a file-and-use approach with approval from the NAICOM. Brokers, agents, and corporate agents are the main intermediaries recognised by the NAICOM. Insurance agents must possess a certificate of proficiency issued in the name of the individual applicant by the Chartered Insurance Institute of Nigeria (CIIN), be duly appointed by an insurer, and licensed by the NAICOM. Furthermore, only firms incorporated as a partnership or limited liability company under the Companies and Allied Matters Act (1990) are permitted to register as insurance brokers. Although, insurance broking firms have no minimum capital requirements, they are required to maintain a professional indemnity cover of whichever is greater of N10million (USD\$0.06 million) or 50 percent of its annual brokerage income for the preceding year. The Insurance Act 2003 does not specify any commission caps for the life insurance segment; however non-life businesses are subject to commission

caps of between 12.5-20 percent depending on the line of business sold (Insurance Act No.1, 2003).

Other Regulation

In 2009, the NAICOM introduced a three-year market development plan - the market development and restructuring initiative (MDRI) - in order to improve market efficiency and increase consumer protection (National Insurance Commission, 2009). The MDRI was focused on four key issues:

- Enforcement of the six insurance products made legally compulsory by the Insurance Act of 2003 and other 'sister regulations'¹⁰.
- Eradication of fake insurance institutions through the establishment of enforcement teams in all the 36-states of the federation monitor compliance with the compulsory insurance products etc.
- Sanitisation and modernisation of the insurance agency system through the introduction of a network agency system, which would further help in the expanding insurance penetration as well as create employment opportunities.
- Introduction of risk-based supervision to replace the compliance based methods of supervision in order to reduce stress and distress from the system.

The objective of the initiative was to deepen and grow the insurance market in order to achieve an industry gross premium target of N1 trillion (USD\$0.64 billion) in 2012 (National Insurance Commission, 2009). In addition to the MDRI initiatives, the NAICOM in June, 2013, published draft operational guidelines for micro-insurance. The guidelines which are an addendum to the Insurance Act of 2003, aim to encourage commercial insurers to deepen their outreach to the low-income market through the reduction of regulatory costs/barriers and also to ensure consumer protection

¹⁰ The six compulsory insurance products covered under various legislations include: (a) Group life insurance- Pencom Act 2004; (b) Employers liability insurance -Workmen's Compensation Act 1987; (c) Buildings under construction-section 64 of the insurance Act 2003; (d) Occupiers liability insurance- section 65 of the Insurance Act 2003; (e) Motor third party insurance- section 68 of the Insurance Act 2003; and (f) Health care professional indemnity insurance- section 45 of the NHIS Act 1999 (National Insurance Commission, 2009).

(National Insurance Commission, 2013) - see Table 2.2 for details of the proposed operational guidelines.

2.2.2 South Africa

Physical and Economic Landscape

The Republic of South Africa is located in the southern tip of Africa with a geographical area of approximately 468,556 square miles and a population of approximately 50 million people, of which 61 percent live in urban areas (World Bank, 2012a). The 2001 census reveals an ethnic population comprising of Black Africans (85%), Whites (9.6%), Coloureds/Mixed (8.9%), and Indians/Asians (2.5%). South Africa is a multilingual country with 3 main languages; English, Zulu and Afrikaans. The main religion is Christianity, which accounts for approximately 80 percent of the total population (Datamonitor, 2011). South Africa is the largest economy in Africa, with gross domestic product (GDP) at US\$ 363 billion, and an annual GDP growth rate of about 3%. The main economic activity of South Africa is in agriculture, extractive industries such as mining, and financial services. The financial service sector which is well developed and sophisticated is the most lucrative of the sector of the South African economy accounting for about 66 percent of total GDP (World Bank, 2012a). Despite being the largest economy Africa, South Africa is characterised by a history of inequality and poverty. The gini coefficient at 0.63 is one of the highest in sub-Saharan Africa, and approximately 31 percent of the population live on less than US\$2 per day (World Bank, 2012a).

Micro-Life Insurance Market

The complex and sophisticated state of the insurance market in South Africa can be traced back to its controversial history. The South African insurance market started in the early 1800s with foreign companies (mainly from the UK) operating through general agents, who usually accepted both long and

short-term policies. As the insurance market developed, foreign firms deployed full time representatives, and opened branch offices to oversee their South African operations (Robert, 2007). Foreign insurance firms maintained strong ties with their parent institutions, and operated in line with international best practices. In the 1970s, the Nationalist government in South Africa implemented a domestication policy in which foreign financial institutions were encouraged to partner with local companies rather than opening subsidiary branches. The policy also sought to allow local institutions and individuals the opportunity to acquire shares in wholly-owned foreign firms. Hence, towards the end of the apartheid era in 1994, foreign insurance subsidiaries were increasingly acquired by indigenous South African firms, as most foreign firms were forced to disinvest due to increasing pressure from parent firms (Robert, 2007).

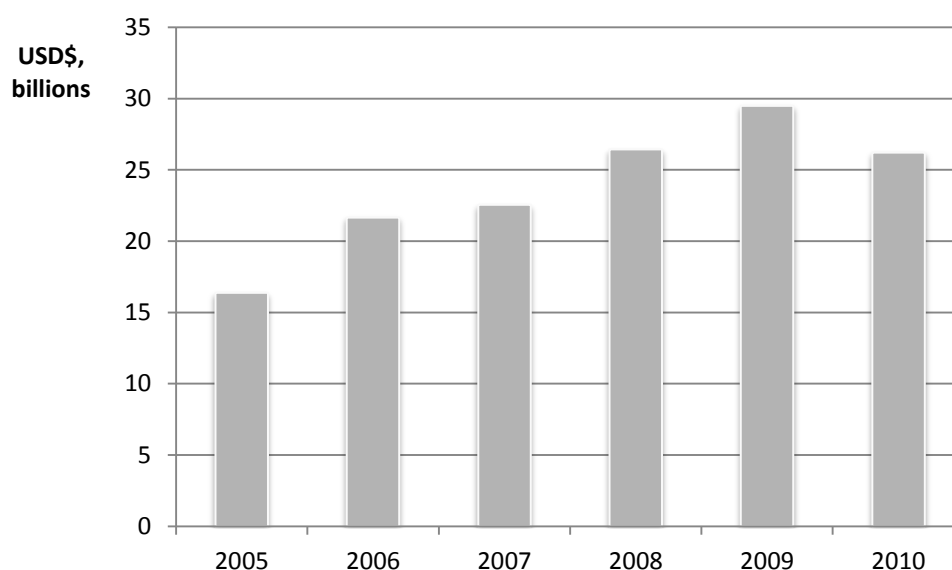
At 16 percent, South Africa has the highest penetration of insurance in the continent of Africa and in fact one of the highest in the world. Insurance penetration exceeds the emerging market average of 3.9 percent, and industrialised country average of about 9 percent (Swiss Re, 2010). The growth of the South African insurance industry can be attributed to the fiscal incentives that have supported the creation of funded company schemes and voluntary savings with insurance companies, as well as the achievement of high rates of return relative to those available on alternative fixed interest investments (Munro & Snyman, 1995). Although the financial services sector, and in particular the insurance industry, is well developed and sophisticated; in terms of products, services, and distribution infrastructure; there is a distinct divide between the intensively served high-income segment of the market and the low-income market (Robert, 2007). The traditional (formal) markets mainly serve the high-income segment while the low-income segments are largely excluded by the formal sector.

The low-income segment rely on informal risk-pooling mechanisms such as mutual burial societies, funeral parlours and savings clubs commonly known as stokvels¹¹. The informal market comprises of about 80, 000 - 100,000 societies serving between 4 - 8 million individuals, and about 3,000- 5,000 funeral parlours providing funeral cover (Bester et al., 2009). Therefore, the government has consistently focused on policies which promote financial inclusion with agreed targets for insurance outreach by commercial insurance providers into the low-income segment of the market, and a drive towards the formalisation of informal risk-pooling mechanisms.

The long-term (life) insurance market in South Africa consists of 75 insurers. The market is dominated by corporate insurers with only one legally recognised mutual insurance provider - AVBOB. A number of burial societies (also known as friendly societies) are permitted to provide funeral insurance formally, within a limited space provided under the insurance legislation (Bester, Chamberlin, Hougard, Hobden, & Smith 2008). The penetration of long-term (life) insurance is higher than short term (non-life) insurance, and accounts for about 78 percent of total industry premiums (Datamonitor, 2011). The life insurance market segment in South Africa is well known for its innovation in terms of product development. Indeed, life products such as universal life and annuity policies have their origins from South Africa (Munro & Snyman, 1995). The South African micro-insurance market is competitive with regard to pricing, and because entry barriers are relatively lower than exit barriers, the entrance of new players into the market in recent years has resulted in further pressure on premium rates. The premium income for life insurance grew by approximately 38 percent between 2005 and 2010 (Financial Services Board, 2010) – see Figure 2.5.

¹¹ Stokvels can be described as a type of credit union, or communal buying group, in which a group of people enter into an agreement to contribute a fixed amount of money to a common pool weekly, fortnightly or monthly to be drawn in rotation according to the rules of the particular stokvel (Lukhele, 1990). The origin of stokvels formerly known as 'stock fairs' in South Africa date back to the early nineteenth century from the rotating cattle auctions of English settlers in the Eastern Cape and existed as a gathering to promote interaction, socialising and gambling among black farmers and labourers. These gatherings/fairs later evolved into meetings of a similar nature in black communities and now serve as the backbone for the provision of informal financial services to people in the poor black communities (Lukhele, 1990).

Figure 2.5 : South Africa: Life Insurance Premiums, 2005-2010.



Source: Financial Services Board (2010)

The history of micro-insurance is traceable to burial societies (informal local community-based risk pooling mechanisms) and funeral parlours which provide unguaranteed cover and benefits in the form of a funeral service in the event of death. The informal market has vigorously developed to fill the traditional (formal) vacuum, and currently accounts for almost half of the total micro-insurance market usage by adults (Bester et al., 2008). In a similar vein, formal (commercial) insurers have also increasingly targeted low income groups, focusing mainly on product development and innovations which comply with the Financial Sector Charter (FSC). The FSC, which came into effect in 2004, is a voluntary commitment negotiated between the insurance industry and various stakeholders to achieve certain access targets¹² which ensure that insurance products and services (based on certain agreed standards) are more readily available to low-income earners. Hence, the so-called CAT (fair Charges, easy Access, and decent Terms) standards were developed based on the UK precedent of product standard to ensure fair charges, easy access, and decent terms (Bester et al., 2009).

¹²The access targets for insurance under the FSC require that 6% of the low-income population have effective access to short-term (non-life) insurance, and 23% to long-term (life) insurance by 2014, which equates to 1.2 million short-term and 4.5 million policyholders (Smith, Chamberlin, Hougard, & Carlman, 2010).

The CAT standards were further incorporated into the *Zimele* principles¹³ by the Life Offices Association (LOA) for the accreditation of micro-life insurance products (Bester et al., 2008). The three main micro-life products offered by commercial insurance providers include funeral (assistance), credit life and savings-linked (endowment policies).

The micro-insurance market in South Africa is different from the rest of Sub-Saharan Africa mainly because there is voluntary widespread demand for funeral cover attributed to the social and cultural necessity of a dignified (mostly costly) funeral even amongst low income individuals (Churchill & Matul, 2012). Bester et al. (2009) report that funeral insurance dominates the market accounting for about 72 percent of the total micro-insurance market, and 93 percent of the voluntary market. Compulsory credit life policies are usually sold on the back of instalment or credit sales agreements on durable consumer goods, to cover the risk of default following the death of the main purchaser. Credit life policies are the second most common micro-life insurance products accounting for about 41 percent of the total micro-insurance market. The growth of the micro-credit market in South Africa is largely attributed to the increasing awareness and demand for credit-life policies. Savings-linked (endowment) insurance is the least common micro-life insurance product in South Africa. The limited supply and low demand of savings-linked products is attributed to the disproportionate tax burden for low income individuals, as well as the complexities surrounding the legal minimum surrender values that have to be provided in the case of early withdrawal (Robert, 2007). Although, there is currently no specific regulation for micro-insurance in South Africa, the FSC defines micro-insurance as insurance products targeted at low income households in

¹³The *Zimele* principles (which literally means 'to stand on one's own two feet' in the Zulu language), which was launched by the LOA in 2007, is the life insurance industry response to the FSC targets for the low income market. Adherence to the *Zimele* principles enabled micro-insurance providers to meet their FSC targets. For a product to gain *Zimele* accreditation, customers have to be able to buy a policy, pay a premium, and/or amend a policy at least once a month within 40km of their residence. The *Zimele* accreditation also serves as a signal to customers in identifying products that are reasonable and trustworthy (Bester et al., 2008).

'living standards measure' (LSM) groups 1-5¹⁴ (Bester et al., 2008). Funeral policies are provided under the assistance business category, while credit-life and savings-linked policies are provided under the life business category – see Figure 2.6. Under the FSC, formal (commercial) micro-life insurers are required to report the contribution of each class of business sold to the low income market (i.e., LSM 1-5) as a percentage of total gross premium income in their annual reports (Financial Services Board, 2010).

Figure 2.6 : South Africa: Distribution of Life Insurance Business.



Source: Financial Services Board (2010)

The distribution of micro-life insurance products in South Africa is traditionally done through third-party intermediaries such as insurance brokers and agents. The sophisticated nature of the intermediary market can be attributed to the historical agency network operations of foreign insurance firms (Robert, 2007). The distribution/intermediary market is dominated by insurance brokers who control a significant portion of life business mainly serve the middle-high income individual segments of the market. The broker/agent channels have not been effective in targeting the low income market due to the high transaction costs involved in the distribution of micro-insurance. Thus, innovation in the distribution channel is crucial for the

¹⁴The LSM is a tool developed by the South African Advertising Research Foundation (SAARF), which is used to segment the wider South African market according to individuals' living standards. The tool uses location (i.e. rural vs. urban), ownership of household assets, and access to services to group individuals into one of ten LSMs through calculation of a composite indicator. LSM 1 is the lowest category containing the poorest individuals, while LSM 10 is the highest category containing the wealthiest individuals when ranked according to the composite indicator (Melzer & Smith, 2004).

successful supply and demand of micro-insurance products (Bester et al., 2008). In South Africa, innovation in micro-insurance distribution has been facilitated by the generally strong payment systems, and the availability of a large and well-developed retail network. Some examples of innovative intermediary channels include independent and/or captive multifunction intermediaries (e.g., retailers, banks, funeral parlours/associations) and organised low-income groups (e.g., burial societies and stokvels). Innovative intermediary channels are able to target large client concentrations, reduce transaction costs, and enable the micro-insurance provider achieve the economies of scale which is vital for profitability (Bester, Chamberlin, Short, Smith , & Walker, 2006).

Regulatory Landscape

Insurance law in South Africa has its roots in the both the Roman-Dutch and English law due to the history and development of the insurance market (Robert, 2007). The life insurance industry in South Africa is primarily regulated by the Long-Term Insurance Act 52 (1998). The Financial Services Board (FSB) is the statutory body in charge of regulation and supervision of life insurers in South Africa. Under the Long Term Act, only public companies are allowed to register as insurers with the exception of AVBOB, a traditionally important player in the assistance business segment. AVBOB is the only mutual insurer permitted due to a special Act of parliament facilitated by significant political and operational support (Bester et al., 2008). Furthermore, no insurer is allowed to have more than one license, and composite firms are not permitted. Prudential regulation stipulates a minimum up-front capital requirement of ZAR10 million (USD\$1.3 million) for life insurance firms. There is no restriction on foreign ownership of insurance firms, and an insurer may be a wholly-owned subsidiary of a foreign company; however branches of foreign insurers are not permitted. The Long-Term Act (1998) permits reinsurers to operate as composites requiring only one license for both long-term (life) and short-term (non-life) policies. Unlike Nigerian insurance firms which are legally required to cede 5 percent of their reinsurance premiums with African Re, insurance regulation in South Africa

stipulates no compulsory legal cession of reinsurance premiums. Insurance firms are permitted to cede reinsurance premiums to foreign reinsurers to the extent that the industry regulator, the FSB, agrees that the local market has insufficient capacity (Long Term Insurance Act No. 52, 1998).

The business categories defined under the Long-Term Act (1998) include; assistance, disability, fund, health, life and sinking fund insurance. Although, product pre-approval is not required, insurers are mandated to register and report separately on each category of insurance policies. Health policies under the Long-Term Act (1998) are restricted to policies providing a fixed amount (non-indemnity) of cover on a defined health event usually in the form of personal and critical illness policies. However, any other policies in the form of indemnity benefits covering medical expenses are excluded and regulated separately under the Medical Schemes Act 131 (1998) (Bester et al., 2009). Furthermore, assistance policies (also known as funeral policies) are defined as a separate product category under the Long-Term Act (1998), and thus subject to different regulatory requirements. The regulatory requirements for assistance policies differ from other long-term product categories in the following aspects;

- Assistance policies are subject to a maximum pay-out benefit of ZAR10, 000 (USD\$1,300) on any one life.
- There is no limitation on the commissions payable to an insurance intermediary in respect of assistance policies.
- The Long-Term Act (1998) requires that policyholders should be given the option of a monetary benefit, even in situations where the terms of the policy contract specifies that payment would be in kind (i.e., provision of funeral).

In addition, friendly societies and co-operatives, which are governed by the Friendly Societies Act 25 (1956) and Co-operatives Act 14 (2005) respectively, are permitted to offer the long-term (life) products, and are also exempted from compliance with the requirements of the Long Term Act as long as the benefits/payout do not exceed ZAR5,000 (USD\$699) per member. Financial intermediaries such as insurance brokers and agents are

regulated primarily through the Financial Advisory and Intermediary Services (FAIS) Act 37 (2002). Insurance intermediaries providing advice and intermediary services to clients are subject to authorisation/registration which requires the fulfilment of certain conditions with regards to education, experience, fit and proper, and reporting. Under the Long-Term Act (1998), the commission levels payable to intermediaries is capped at 3.25 percent for individual life, health and disability products (Bester et al., 2009).

Other Regulation

Following the end of apartheid in 1994, the financial services sector faced pressure from the government to extend the provision of financial services to the low-income sector. Hence, the introduction of the FSC in 2004 which specified access targets for the commercial (formal) insurance industry- see footnote 12. The growth and expansion of micro-insurance in recent years has been largely attributed to the increased drive by commercial (formal) insurers in achieving the access targets as described in the FSC (Chamberlin, Ncube, Chelwa, & Smit, 2011). Furthermore, the need for consumer protection in the emergent credit life insurance market resulted in the implementation of the National Credit Act (2005) which stipulates the need for transparent products and pricing, as well as the giving clients the option to select a preferred insurance provider when taking out credit agreements (Bester et al., 2009). In 2011, the National Treasury (the policy-making body for the financial sector) in conjunction with stakeholders, such as the FSB and insurance companies, set out a framework for the regulation of micro-insurance in South Africa. The proposed regulation which is set to be implemented in 2014, aims to reduce the regulatory costs to facilitate outreach into the low income market by formal insurers, and provide formalisation and graduation options for the informal market (South African National Treasury, 2011) (see Table 2.2 for details of the proposed regulation).

Table 2.1: Nigeria and South Africa: Key Economic Indicators.

Indicator	Nigeria	South Africa
Population (millions)	160	50
Urbanisation (%)	49	61
Percent of population on < US\$ 2 per day (%)	84.49	31.33
Percent of population on < US\$ 1.25 per day (%)	67.98	13.77
Gini coefficient	0.48	0.63
Literacy (% of Adults)	82	61
Gross Domestic Product (GDP)- (US\$ billions)	228	363
GDP/Capita(US\$)	1,121	5,695
GDP growth rate (%)	3	8
Average Annual Inflation rate (%)	11	4
Average Annual Interest rate (%)	7.5	5.5
Insurance penetration (insurance premiums/GDP) (%)	<1	16

Sources: World Bank (2012a); International Monetary Fund (2012) .This table presents some key economic indicators for Nigeria and South Africa for 2011/2012. The Gini coefficient (index) is a measure of income disparity. The closer the gini coefficient is to 1, the greater the variation between the rich and poor. On average female life expectancy in the two sub-Sahara African countries listed in this table is about 4 years more than for their male counterparts. Inflation is measured as the average annual change in the Consumer Price Index (CPI) in 2011/12. Interest rate is defined as the average annual commercial bank lending rate in 2011/12.

Table 2.2: Characteristics and Definition of Micro-insurance: Proposed Regulation.

	Nigeria	South Africa
Definition	"...insurance that is accessed by the low income population; provided by licensed institutions, and run in accordance with general principles."	"...insurance products which are accessible and/or used by low-income households".
Benefit Limits	Life and Non-life = N1 million (USD\$ 6,380)	Life= ZAR50,000 (USD\$ 6,380), Asset =ZAR100,000(USD\$ 13,000)
Capital requirements	Life=N150 million (USD\$0.96 million) Non-Life=N200 million (USD\$1.28 million).	Life and Non-life = ZAR3 million (USD\$0.39 million).
Term Limits	n/a	Maximum = 1 year
Product Features	Simplicity in product design. Terms must be simple and easily understood.	Simplicity in product design and disclosure requirements.
Reinsurance	Adequate reinsurance arrangements required.	Reinsurance not compulsory.
Demarcation	Composite life and non-life micro-insurance products are allowed, but separate insurers must underwrite the risk.	Composite products underwritten by the same provider permitted.
Intermediary/ Distribution Channels	Alternative distribution channels permitted in addition to the traditional broker/agent; however commission is capped $\leq 20\%$ for life insurance, and $\leq 15\%$ for non-life.	Alternative distribution channels allowed; however commission paid to intermediaries is uncapped.
Institutional Aspects	Only firms incorporated as a limited liability company are permitted to register as a micro-insurer.	Public companies, co-operatives, and friendly societies may become micro-insurers.
Existing formal insurers	May underwrite micro-insurance as a separate business/ department under existing licence.	Must obtain a separate license in order to be able to underwrite micro-insurance business.

Source: National Insurance Commission (2013), South African National Treasury (2011). This table presents the main characteristics of the proposed regulation for micro-insurance in Nigeria and South Africa.

2.3 Justification of Institutional Context

Nigeria and South Africa are considered to be good environments within which to focus the present study for the following reasons:

- *Low-income population:* Although Nigeria, and South Africa are the two largest economies of sub-Saharan Africa, a large proportion of the population live on less than USD\$2 per day, and the proportion of the population which is extremely poor (i.e., individuals who live on less than USD\$1.25 per day) is significant especially for Nigeria – see Table 2.1. The large proportion of low income households in both countries suggest that micro-insurance is the most appropriate insurance category for a considerable proportion of the population and its effective supply should be a priority for the insurance sector. Indeed, the increasing incidence, extent and complexity of poverty in Sub-Saharan Africa represents major economic, social, and political challenges for domestic governments and the international community. The effective supply of micro-insurance could help countries of sub-Saharan Africa and elsewhere to alleviate socio-economic poverty, promote financial stability and foster economic development and sustainability (e.g., see Hamid, Roberts, & Mosley, 2011). Therefore, Nigeria and South Africa provide potentially interesting institutional environments within which to examine and compare the profitability of primary micro-life insurance suppliers.
- *Low insurance and micro-insurance take-up:* The level of insurance take up and penetration in Nigeria is consistently below 1 percent of GDP. De Vos et al. (2011) report that the insurance sector in Nigeria serves less than 1 percent of the adult population. In addition, the report highlights poor product offerings and lack of trust in the insurance sector as the main factors limiting the take-up of insurance in Nigeria. On the other hand, insurance penetration in South Africa, at 16 percent is one of the highest in the world. The high take-up and

penetration of micro-insurance in South Africa is largely driven by the voluntary demand for funeral insurance which accounts for about 72 percent of the total micro-insurance market. However, there is limited take-up of other non-funeral life insurance products (e.g., weather-index insurance) in spite of the recent innovations and introduction of products tailored to the needs of the low-income market (Bester et al., 2009). Thus, the limited domestic insurance markets suggest that there is considerable scope for the future growth in demand and expansion for micro-insurance products in both Nigeria and South Africa.

- Nigeria and South Africa represent areas of the world where the demand and supply of micro-insurance is growing in line with broader micro-finance development initiatives and domestic economic growth and development (e.g., see Cohen, McCord, & Sebstad, 2005; Cohen & Sebstad, 2005). Indeed, Cohen and Sebstad (2005) report that in Sub-Saharan Africa consumer demand for key asset (prime-earner) protection (life and health) insurance is moving away from self-insurance (risk retention) to external risk pooling (risk transfer). This arises as individuals seek to move out of poverty and small (e.g., family-owned) businesses focus on diverting resources from unproductive self-insurance arrangements to more productive income-generating activities.
- A cross-country comparative study such as the current research project can reveal how differences in insurance regulation between jurisdictions might influence the financial performance of micro-insurance providers. For example, the profitability of micro-insurers could be affected by external rules governing premium tariffs, public subsidies, actuarial standards, coverage limits, and so on. These considerations should help highlight the impact of different regulatory structures on underwriting results (Crawford-Ash & Purcal, 2010a). This infrastructural aspect could be of direct interest not only to micro-life insurers, and their international insurance and reinsurance partners but also to international aid agencies such as the African

Development Bank, World Bank, and the International Monetary Fund (IMF). Indeed, Mosley (2003, pp. 151) adds that “. . . because the protective motive of insurance appeals particularly strongly to the poorest people, the customers of micro-insurance schemes are at risk of exploitation within an unregulated market.”

2.4 Summary and Conclusion

This chapter has presented the institutional background for the two countries - Nigeria and South Africa - that are the focus of the present study. In particular, the chapter has examined the institutional context for both Nigeria and South Africa in terms of the economic and physical landscape, the nature of the micro-life insurance market, and the regulatory landscape within which micro-insurance providers currently operate. The characteristics of the proposed regulation and/or guidelines for micro-insurance in both countries are also briefly depicted. Furthermore, the chapter highlights the salient features of the micro-life insurance markets in both countries which qualify them as suitable environments for the conduct of the present study. Therefore, based on the institutional context, Nigeria and South Africa represent potentially interesting domains in which to examine the determinants of the profitability of micro-life insurance firms. The theoretical and empirical literature relating to micro-insurance and financial performance is now reviewed in the next chapter of this thesis.

Chapter 3

Literature Review

3.1 Introduction

This chapter examines the theoretical and empirical literature relating to micro-insurance. In particular, the chapter describes the origin, definition and perspectives of micro-insurance; the differences between micro-insurance and conventional insurance; and micro-life insurance product-types. Furthermore, the chapter reviews the literature on determinants of the financial profitability of micro-insurance firms. Specifically, the literature on transaction costs, information asymmetry, reinsurance and leverage are examined. Intuitions drawn from the review of literature are employed in the development of the research hypotheses outlined in chapter 4 of the thesis.

3.2 The Origin of Micro-Insurance

Despite the growing recognition that micro-insurance can play a significant role in the future development of emerging economies such as those in sub-Saharan Africa, the concept of micro-insurance is not a new phenomenon. In fact, the principle of risk protection through risk pooling underpinned the early mutual pools, friendly (including affiliated) societies, and co-operative insurance schemes for low-income groups in industrialized countries such as the UK and US during the eighteenth and nineteenth centuries (e.g., see Crawford-Ash & Purcal, 2010b; Plater, 1997). The friendly society movement that emerged in the UK in the eighteenth and nineteenth centuries embraced a variety of organizational forms some of which provided risk (e.g., life insurance) protection for the industrial working class as well as middle class interest groups such as the medical profession and clergy. 'Affiliated order societies' (e.g. trade unions) tended to have exclusive working class members who made regular contributions to a risk pool that provided

financial relief in the event of some future hardship (e.g., an industrial accident). The governance of affiliated orders were often local but under the control and supervision of a central office. Moreover, mutuality was promoted by regular social events and local community involvement in the society and its management of the risk pool. Local knowledge and scale economies in the processing of risk information further helped friendly societies control information problems such as adverse selection and moral hazard (Plater, 1997). In the twentieth century, many friendly societies became amalgamated with larger insurers – a process of consolidation which is currently occurring in emerging economies such as South Africa (South African National Treasury, 2008). Micro-insurance-type arrangements are not necessarily confined to contemporary developing economies, but they can also have a place among socially excluded groups in cities and rural areas in more developed parts of the world such as the UK and Ireland (Dror & Armstrong, 2006). Indeed, the origin of micro-insurance in Africa is also linked to informal risk pooling groups such as friendly societies and funeral associations (Berg, 2011). Therefore, micro-insurance could serve as a potentially efficient and effective market solution to risk management issues in emerging economies. As such, it can be an important mechanism for reducing poverty and underdevelopment in less developed parts of the world like Africa.

3.3 Definition of Micro-Insurance

Churchill (2007) defines micro-insurance as the protection of low-income groups against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of risk involved. The International Association of Insurance Supervisors, IAIS (2007) also define micro-insurance as a type of insurance which is accessed by the low-income population, provided by a variety of different entities, but run in accordance with general insurance practices. Regardless of the varying definitions of micro-insurance, there is a common element of insurance protection for low income people. On the other hand, the identification of what qualifies as 'low income' is debatable. Consequently, what constitutes micro-insurance varies

between different jurisdictions, and is dependent on the national or corporate objectives of industry regulators and/or insurers. Although there is no clear encompassing definition for micro-insurance, Churchill and Matul (2012) identified four main ways to make the definition of micro-insurance operational. These are:

- *Target group:* This definition describes micro-insurance as insurance products targeted at low-income people. However, for insurers and/or industry regulators, the classification of what qualifies as 'low income' varies by individual and by country. Therefore, using this definition, insurers face a difficulty in ascertaining whether a prospective policyholder is sufficiently poor to qualify for micro-insurance.
- *Product Definition:* The definition of micro-insurance could be based on product features which ensure that the product is relevant for the target (low-income) households. In this approach, micro-insurance products are characterised by low premiums and/or low sums assured. This definition is particularly used by micro-insurance regulators whose aim is to entice existing insurers to provide risk protection for the poor. However, the restriction in product features could impede the innovative capacity of the insurer.
- *Provider Definition:* Micro-insurance can be defined in terms of the nature of the organisation that can provide it. For example, local insurers such as small mutual, co-operatives, friendly-societies and community-based organisations could provide micro-insurance alongside formal insurers. Smith et al. (2010) report that the use of a vast number of unconventional institutional arrangements (e.g., co-operatives and friendly-societies) is required to reach the underserved market. Thus, a definition that places emphasis on specific provider-types could hinder penetration and expansion.
- *Distribution Channel:* The definition of micro-insurance could be further described in terms of the intermediary involved in the distribution process. Micro-insurance products could be distributed

using conventional channels (e.g., micro-finance institutions (MFIs)) as well as unconventional channels such as low cost retailers, utility and telecommunication firms, or any organisation that has a footprint in the low-income market (Bester et al., 2006).

Furthermore, Churchill (2006a) proposes the two main perspectives of micro-insurance. The first perspective describes micro-insurance as a means of extending social protection facility for the poor in the absence of alternative government welfare schemes. The second view is that, micro-insurance could offer a vital financial service to low income households by developing an appropriate business model that enables the poor to be a viable market segment for commercial insurers.

3.3.1 Micro-insurance - Social Protection Perspective

Risk is a common phenomenon which affects the lives of individuals and households¹⁵. In the presence of risks and shocks, individuals (especially the wealthy and non-poor) draw on their ex-ante risk management instruments to manage the resultant expenses. However, for low-income individuals especially in developing countries who have no access to precautionary risk management tools or social protection systems, the presence of risks and shocks severely impacts their welfare as they have to rely on their financial, physical and human assets (Churchill & Matul, 2012). Some of the strategies employed by the poor to cope with loss events include selling productive assets, informal credit arrangements, and family and mutual support networks. Churchill (2006b) contends that informal risk coping strategies are inefficient, insufficient and unreliable especially in the face of covariant shocks which systematically affect members of the same community. In addition to the loss of welfare due to unforeseen risks, low income individuals and households suffer from the on-going uncertainty about the occurrence and timing of loss events. As a result they are unable to take

¹⁵ Risk can be defined as the chance of loss or loss itself. It arises when the possibility of an event with negative effects leads to a decline in income for a person or household (as in the case of unemployment) or a rise in expenditure (as in the case of a price shock), or both (as would be the case when an illness leads to disability that prevents employment and results in health care costs) (e.g., see Churchill & Matul, 2012; Cohen & Sebstad, 2005).

advantage of income generating opportunities that could reduce poverty. Several studies (e.g., see Dercon, Kirchberger, Gunning, & Platteau, 2008; Murdoch, 1999) have shown that the ability of low-income groups to rise out of poverty in the long-term is impeded by the substantial welfare costs incurred in dealing with unexpected losses due to death or disability. Murdoch (1999) in his study of the risk strategies used by the poor in developing countries also noted that informal risk-coping mechanisms only serve as a partial protection for low income groups. Furthermore, Dercon et al. (2008) highlight the use of financial instruments such as flexible savings and credit products, and social protection systems as risk-coping strategies which could help low income households to manage risks.

Social Protection systems generally involve a variety of government policies and programs (e.g., universal healthcare, unemployment and disability benefits, maternity old age pensions etc.) which help to reduce poverty and vulnerability by diminishing people's exposure to risks and enhancing their capacity to protect themselves (Churchill & Matul, 2012). Since the 1970s, the social protection policies of several countries in sub-Saharan Africa (with the exception of some countries like South Africa) have focused on emergency food aid, famine relief and humanitarian assistance. For example, in countries such as Zambia, Kenya, Nigeria, Ghana, Uganda and Malawi there has been a continuous shift from emergency aid focus into more permanent social protection programs such as the spread of aid-financed pilot cash transfer schemes targeted at the poor and most vulnerable. On the other hand, Southern African countries such as South Africa, Namibia, and Botswana have a relatively more robust social assistance system which provides grants for vulnerable groups especially women and children (Barrientos & Hulme, 2008). Despite the efforts of various governments, there is still a global shortfall in social protection as more than half of the world's population have no access to social security systems. Indeed, the situation is reported to be more severe in developing countries particularly sub-Saharan Africa and South Asia where the coverage of statutory social protection is estimated at 5-10 percent of the working population (Garcia & Gruat, 2003). Micro-insurance schemes could therefore serve as crucial components in the development of comprehensive social protection schemes

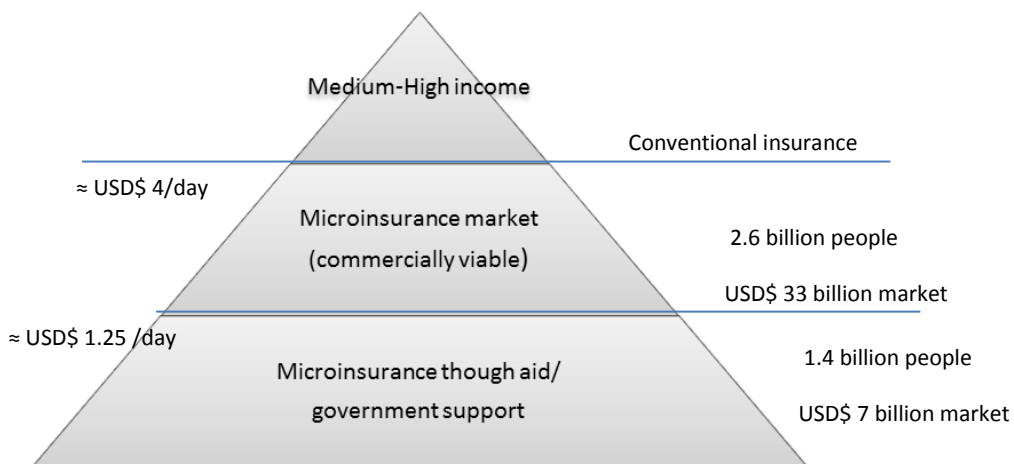
and assist in filling the gaps created by inadequate social protection systems. Furthermore, compared to informal savings and credit products, micro-insurance could provide an efficient means by which low-income households could access protection, and enable a more complete coverage for large losses. In particular, micro-insurance could give the poor access to formal insurance services (e.g., risk protection advice), and provide a means of coping with the consequences of severe economic shocks (Dercon et al., 2008). In a similar vein, Leftley and Mapfumo (2006) also acknowledge that when used with other financial instruments such as credit and savings, micro-insurance could provide an invaluable safety net for low income groups.

3.3.2 Micro-insurance - New market Perspective

Micro-insurance could serve as an opportunity to expand into new markets for participants such as multinational insurers and reinsurers (e.g., through joint-ventures) and can be a potential source of profitable new business for insurance providers (Churchill, 2007). The new market perspective of micro-insurance derives from the 'Bottom of the Pyramid' (BoP) strategy established by Prahalad (2006) who proposed that the low income market represents a significant untapped opportunity for value-creation. Prahalad's (2006) BoP concept which identifies the common principles for operating in the BoP market draws on case studies from micro-finance and other industries such as construction, consumer goods and healthcare. Prahalad (2006) emphasises that the viability of firms in the BoP market segment is dependent on innovation in systems and processes that would facilitate the production of goods and services tailored to the needs of the low income people. The provision of insurance for the low income market has received widespread attention and growing interest from a variety of stakeholders and regulators in recent years mainly due its estimated market potential. For example, Lloyd's of London (2009) estimates the market potential for micro-insurance to be between 1.5 and 3 billion policies with annual growth rates of approximately 10 percent or higher. Furthermore, Swiss Re (2010) using the Prahalad (2006) BoP concept categorised the low-income market into two

broad segments based on consumption level and ability to afford premiums (see Figure 3.1). Swiss Re (2010) classified the segment at the bottom of the pyramid as the extremely poor people who live on less than US\$1.25 per day and account for 1.4 billion people globally. The second segment which consists of people who survive on between US\$1.25 and US\$4 per day accounts for about 2.6 billion of the global population. The second segment is classified as the 'target market' for commercially viable micro insurance as the population in this segment is able to afford premiums. Swiss Re (2010) further reports that micro-insurance markets in these two segments of the pyramid, as shown in Figure 3.1, could generate incomes of up to USD\$40 billion. The revelation of the huge market potential has led to an increased entry of commercial insurers into the low-income market. Coydon and Molitor (2011) in a survey of commercial micro-insurers, reveal that the involvement of commercial insurers in micro-insurance is mainly driven by the objective to invest in a new market and realise expectations of profitable growth. In addition, corporate social responsibility (CSR), brand recognition and mandatory regulation were also identified as important factors for entering into low income markets such as those that characterise developing countries like those of sub-Saharan Africa.

Figure 3.1 : Potential Market Estimates for the Global Micro-Insurance Market.



Source: Adapted from Swiss Re (2010). This figure presents the potential market estimates for the global micro-insurance market. USD\$ refers to the poverty line in terms of Purchasing Power Parity International dollars.

3.4. Characteristics of Micro-Insurance

The low income sector represents a vast untapped and attractive opportunity for commercial insurers as it could help to diversify their business into new markets, capture emerging market growth, and contribute to financial profits as well as secure broader social welfare goals (Churchill & Matul, 2012). The low income market is distinct from the traditional insurance market - see Table 3.1. Hence, a better understanding of the nature and characteristics of the market is essential for sustainable micro-insurance provision and take-up. Swiss Re (2010) outline the core elements for the effective provision of micro-insurance as follows:

- *Insurance Principles:* In a similar manner to traditional insurance, micro-insurance is based on insurance principles which involve the payment of premiums by policyholders in exchange for the promise of indemnification by the insurer in the event of a covered loss. Biener and Eling (2012) contend that for risks to be insurable, loss exposures must be independent and loss probabilities should be estimated reliably; the maximum possible loss per event must be manageable in terms of insurer solvency; the average loss per event must be moderate; loss exposure must be sufficiently large; and the potential problems resulting from information asymmetry cannot be excessive.
- *Accessibility:* The target market for micro-insurance is low income groups including individuals who do not have access to conventional insurance. Therefore, micro-insurance products and services should be designed to reach the 'remote' segments of the society. In particular, partnership with institutions (e.g., retailers, co-operative societies etc.) which are traditionally not involved in insurance but have a large footprint and reputation in low income markets is essential in achieving economies of scale (Churchill & Matul, 2012).

Table 3.1: Differences between Micro-Insurance and Conventional Insurance.

	Micro-Insurance	Conventional Insurance
Target Market	<ul style="list-style-type: none"> • Low-income individuals • Extremely limited knowledge of insurance 	<ul style="list-style-type: none"> • High and medium income individuals. • Market is largely aware of insurance benefits
Underwriting	<ul style="list-style-type: none"> • Simple underwriting practices; small sum assured. • Simple policy language with minimal or no exclusions 	<ul style="list-style-type: none"> • Comprehensive underwriting; large sum assured. • Complex language with multiple exclusions, terms and conditions
Product Design	<ul style="list-style-type: none"> • Simple product design with easy to understand features. • Community or group pricing; limited actuarial data 	<ul style="list-style-type: none"> • Multiple coverage and features. • Risk-based pricing driven by multiple parameters; good data quality
Marketing and Distribution	<ul style="list-style-type: none"> • Innovative distribution with multiple tie-ups • Usually sold as combined product through MFIs 	<ul style="list-style-type: none"> • Employs conventional channels. • Insurance sold by licensed intermediaries
Administration	<ul style="list-style-type: none"> • Irregular premium payments, by cash or bundled with other products 	<ul style="list-style-type: none"> • Regular payments by cheque, direct debit or credit card
Claims handling	<ul style="list-style-type: none"> • Simple and quick claims turnaround process; limited documentation 	<ul style="list-style-type: none"> • Comprehensive process; detailed documentation

Source: Adapted from Swiss Re (2010)

- *Affordability*: Micro-insurance products are generally characterised by low premiums and sums assured in order to ensure affordability by the target market. Indeed, the viability of micro-insurance products is dependent on the ability of the insurer to strike a balance between the needs of the low income market and adequate (and affordable) pricing (Swiss Re, 2010).
- *Flexibility*: Micro-insurance products and processes must be tailored to meet the needs to the of the target population. Indeed, a 'one-size fits all' approach in terms of product design, premium collection and distribution is ineffective (Olaosebikan, 2013).
- *Simplicity*: The low income market consists of individuals with limited or no knowledge of insurance. Therefore, simplicity in terms of underwriting conditions, premium collection and policy language is essential (Swiss Re, 2010).

3.5 Micro-Life Insurance Product Types

The most popular micro-life insurance product types in sub-Saharan African countries such as Nigeria and South Africa include, savings-linked insurance, credit life insurance and funeral insurance (Churchill & Matul, 2012). The key features of these micro-life insurance products are outlined below:

- *Savings-linked insurance*: Rusconi (2012) highlights the use of contractual savings products as one of the means by which low income individuals and households can manage risk. However, in the face of major losses, the use of savings products might be an insufficient risk management tool. Savings-linked insurance is similar to endowment policies in that it covers the risk of death and accumulates value over time. Endowment policies are products which usually combine life insurance and long-term contractual savings. Traditional endowment policies involve regular premium payments over the long-term, of at least five years or more at the end of which the client receives a lump

sum plus a bonus. However, if the client dies before the end of the term the beneficiary receives the sum assured. For low income clients, the surrender value in the event of premature cancellation of traditional endowment products is usually low because of the irregular premium payments as well as the high commissions paid to agents (Roth, Garand, & Rutherford, 2006). In order to provide more value to low income clients, the new wave of savings-linked micro-insurance products seek to address issues of high delivery costs and irregular premium patterns which plague traditional endowment products (Churchill & Matul, 2012).

- *Credit life insurance*: This is the most prevalent type of micro-life insurance product and usually the starting point for organisations looking to enter the micro-insurance market (Churchill & Matul, 2012). A typical credit life policy covers the principal and interest of a loan in the event of the death of the borrower. Credit life policies, which are usually provided through MFIs and credit cooperatives, help eliminate the risk of borrowers' mortality risk (and hence non-repayment of the loan) by transferring some of the cost to the borrower, thus protecting the loan portfolio as well as shareholders or member-owners. For micro-insurance providers, credit life policies tend to be more profitable, straightforward to administer, and provide a relatively easy access to a large customer base with a potential for the demand of other insurance services products (Matul et al., 2010; Roth et al., 2007). In addition, credit life policies are usually offered as a mandatory requirement to obtaining micro-loans, and are relatively easy to understand by the low income market (Churchill, 2006a). On the other hand, credit life products have been criticised as being more valuable to the providers than the borrowers in spite of its potential in reducing the financial strain of family/group members following the death of the borrower. For example, Manje (2005) in a study of a Zambian MFI found low client satisfaction (value) for credit life products. He contends that the mandatory nature of credit life policies

meant that most borrowers were unaware of the coverage provided as the premiums paid were perceived as a fee for obtaining micro-loans.

- *Funeral insurance:* This type of policy covers the funeral expenses in the event of the death of the policyholder. The benefits/payout of a funeral policy could be in form of a funeral service, cash benefit or a combination of both (Churchill & Matul, 2012). The prevalence of funeral insurance (e.g., in South Africa) as noted earlier in Chapter 2, section 2.2, can be attributed to the social and cultural requirements for the deceased to have a dignified burial. Funeral insurance is usually provided by a variety of formal (e.g., commercial and co-operative insurers) and informal (e.g., community groups, funeral parlours and burial societies) providers. The history of funeral policies and indeed insurance can be traced back to funeral associations which are informal mutual risk pooling groups that ensure decent funeral for members or any other nominated persons in the event of death (Berg, 2011). In large parts of Africa, funeral insurance is the most popular type of insurance. Prior research (e.g., see Dercon, De Weerd, Bold, & Pankhurst, 2006; Dercon et al., 2008) examine the prevalence of informal group based funeral insurance in Ethiopia and Tanzania and report that nearly 90 percent of rural households in a representative sample of the rural Ethiopian population belonged to at least one funeral scheme. In South Africa, approximately 45 percent of the adult population has funeral cover through a burial society (Churchill & Matul, 2012).

3.6 Links between Micro-Finance and Micro-Insurance

Micro-finance can be generally described as the provision of financial services (usually credit and savings) to low-income individuals who do not have access to formal banking services (Murdoch, 2000). Prior research (e.g., see Sebastad & Cohen, 2001) have shown that the 'micro-finance trinity' of savings, credit and insurance could assist in capital accumulation, income smoothing, and help improve the risk-bearing capacity of low income individuals and vulnerable households. In particular, MFIs could help strengthen the risk bearing capacity of low income households by providing credit to finance new economic activities whilst adopting new technologies to improve access and cost using group dynamics. Although credit unions and co-operatives have served the needs of the poor for several centuries, the development of modern micro-finance is often credited to Dr. Mohammed Yunus who launched an action research to examine the possibility of designing a credit delivery system to provide banking services targeted at the rural poor in Bangladesh. Dr. Mohammed Yunus later went on to establish the Grameen Bank in 1983. Since then, innovation in micro-finance as well as the providers of financial services to the poor has continued to evolve (Siegel, Alwag and Canagarajah, 2001). The World Bank (2012) estimates that about 160 million people in developing countries are served by micro-finance. Brown and Churchill (2000a) describe micro-insurance an extension of micro-finance into the realm of insurance to deal explicitly with risk management. The pioneering attempts in the provision of micro-insurance have been closely linked to micro-finance programs because the existing networks of MFIs makes the delivery of micro-insurance products less costly. Furthermore, MFIs have increasingly perceived a demand for a risk management product (i.e. credit life) which protects both their clients' and their own interests- see section 3.5. Therefore, micro-finance and micro-insurance instruments and services have developed concurrently to provide access to low income households who do not have access to formal financial services due to high transaction costs, information asymmetry problems (i.e. moral hazard and adverse selection), and lack of collateral (Murdoch,2000).

3.7 Related Literature

This section now reviews the key literature relevant to analysing the demand and supply of micro-insurance in developing economies such as those of sub-Saharan Africa.

3.7.1 Transaction Cost Economics

Transaction cost economics (TCE) which is closely related to the information asymmetry and agency theory literature opines that economic activity takes place in firms as they are efficient in controlling the twin problems of bounded rationality (i.e., incomplete and costly contracting) and managerial opportunism (i.e., self-seeking behaviour). TCE further argues that cost-effective contractual commitment in complex business transactions (such as insurance) can be facilitated through the purchase of transaction-specific assets (Williamson, 1979)¹⁶. These specific-assets help reduce the information and frictional costs of conducting insurance in established markets (Adams 1997).

Micro-insurance arrangements may not necessarily have the transaction-specific assets necessary to cost-effectively control contracting problems such as bounded rationality and other market frictions. Indeed, the high transaction costs involved in the management of large volumes of small policies is a major hindrance to the penetration of micro-insurance in sub-Saharan Africa and other parts of the world (Churchill & Matul, 2012). Significant expenses are incurred by micro-insurers in designing appropriate insurance products, distributing insurance in new markets, collecting premiums from persons who may not have bank accounts, and assessing and paying out small claims (Churchill, 2007). For example, Collier, Skees, and Barnett (2009) highlight the increased administrative costs in promoting weather-index insurance to farmers in rural areas of developing countries

¹⁶ Adams (1997) contends that in insurance markets, transaction-specific assets can be physical in nature (e.g., specialist production technology such as computer systems) and/or human-specific (e.g., the specialist insurance knowledge of actuaries).

who usually have no prior experience with any form of insurance or risk management arrangements. Jutting (2004) in a study of community health insurance schemes in Senegal, West Africa find that larger, and more formal health insurance schemes faced higher transaction costs due to enhanced information asymmetry problems compared with the smaller insurance schemes operated by local co-operative/mutual-type structures. The high transaction costs of participating in micro-insurance could raise prices beyond the means of local communities and could thus help explain, at least partially, the relatively high income and price elasticity of demand profile of some micro-insurance schemes in segments of the market such as the health care micro-insurance sector in rural India (Ito & Kono, 2010). Furthermore, Swiss Re (2010) reports that the long-term profitability and sustainability of micro-insurance is dependent on the ability of the micro-insurance provider to build a cost-effective infrastructure given the high operating and administrative cost involved in reaching remote areas.

Cost efficiency in financial institutions (especially in the insurance industry) has received a lot of attention in the academic literature (e.g., see Abdul Kader et al., 2010; Biener & Eling, 2011; Eling & Luhnen, 2010a; Fenn, Vencappa, Diacon, Klumpes, & O'Brien, 2008). Cummins and Zi (1998) define cost efficiency as the ratio of the costs of a fully efficient firm with the same output quantities and input prices to the given firm's actual costs. Abdul Kader et al. (2010) in their efficiency study of the takaful insurance industry find an overall average cost efficiency of 70 percent which is comparable to the efficiency scores of insurance firms in developed countries. They contend that the use of non-executive directors and the separation of the CEO and chairman functions have no significant impact on cost efficiency. Eling and Luhnen (2010b) in their international insurance efficiency study find a steady technical and cost efficiency growth with large differences in efficiency estimates across countries. Furthermore, Fenn et al. (2008) in a study of efficiency in European insurance firms find that during the sample period investigated, insurance firms were operating under conditions of decreasing costs. They also contend that larger firms and those with high market shares tend to be the most cost inefficient. However, only a few prior studies have directly examined the impact of cost efficiency on

profitability. For example, Greene and Segal (2004) in the study of profitability and efficiency in the US life insurance industry, find a negative association between cost inefficiency and profitability. They contend that cost inefficiency is substantial relative to earnings and that inefficiency arises in firms due to the suboptimal usage of resources either by overpaying for inputs and/or by employing a technologically inferior process. They further demonstrate that the adverse effect of cost inefficiency translates into lower firm profitability. Choi and Weiss (2005) examine the relation between market structure and performance in US property-liability insurers find that cost efficient firms are able to charge lower prices and thus earn higher profits than cost inefficient firms. The finding of Choi and Weiss (2005) is consistent with the 'efficient structure hypothesis' which proposes that cost efficient firms are able to grow in size and market share because they are able to charge lower prices than their competitors while maintaining profitability.

3.7.2 Information Asymmetry

The notion of asymmetric information and its impact on influencing market micro-structure is closely related to the agency theory. Jensen and Meckling (1976) highlight the agency incentive conflicts that can arise between different contracting constituents (e.g., shareholders and managers) due to the increased separation of ownership and control as an organization grows in size. Two basic features of the agency problem particularly relevant in the context of insurance are: (i) the problem of goal divergence between the economic interests of principals (owners) and agents (managers), and the associated agency costs borne by principals in verifying that delegated agents are acting in ways that maximize their utility; and (ii) inefficient risk-sharing which arises when principals and agents have different attitudes towards risk (Eisenhardt, 1989). In addition, Rothschild and Stiglitz (1976) demonstrate that adverse selection (and its 'sister' concept, moral hazard) is all-pervasive in insurance transactions due to information asymmetries between the insurance company and the insured. As a result, the owners/managers of insurance companies have to control such problems

through ex-post monitoring, and the use of contractual mechanisms such as the use of restrictive covenants. The key objective of managers and shareholders of insurance companies is, in the face of agency problems and information asymmetries, to determine an optimal incentive contract that maximizes shareholders' wealth at the lowest cost. The concepts of adverse selection and moral hazard in the context of micro-insurance are examined further below.

3.7.2.1 Adverse Selection

Adverse selection which is sometimes referred to as the 'lemons problem' after Akerlof's (1970) analysis of information asymmetry and pricing in the US second-hand motor vehicle market, relates to the risk that prospective policyholders (insured agents) have utility maximizing incentives to actively withhold private information from the insurer ex-ante in order to secure economic advantages (from higher than anticipated claims) later on. Rothschild and Stiglitz (1976) showed that adverse selection is all-pervasive in insurance transactions due to information asymmetries between the insurance company and the insured. Bryant and Prohmmo (2002) in their study of village funeral insurance societies in North-East Thailand (in which equal contributions are made by all participating households with unequal risks) find evidence of minor adverse selection. In their study, the sustainability of the funeral insurance scheme was attributed to its ability to reduce information asymmetry ex-ante by restricting membership only to households in the village within a specified threshold of acceptable risk. Dercon et al. (2006) also find evidence of adverse selection for funeral insurance in Tanzania and Ethiopia. Furthermore, Giesbert et al. (2011) in a study of micro-life insurance in Ghana report evidence of adverse selection and life-cycle effects. They found that risk averse households and individuals who considered themselves more exposed to risk than others were less likely to purchase insurance. Smith et al. (2010) in their study of alternative distribution channels for micro-insurance in South Africa argue that adverse selection is exacerbated in small risk pools. In addition, several studies have also focused on economically efficient remedial strategies to curb and/or

reduce adverse selection in insurance markets. For example, Rothschild and Stiglitz (1976) show that a Pareto optimal insurance market ('separating equilibrium') can be achieved when insurance companies offer prospective policyholders (of an observationally uncertain risk-type) a menu of different contract types that enable high and low risk-types to choose a form of contract that reflects their individual risk preference and risk exposure. Prior studies (e.g., Dionne & Lasserre, 1985; Gal & Landsberger, 1988) propose that in addition to contracting and monitoring mechanisms, adverse selection can be effectively controlled using experience rating (i.e., where premiums are based on actual loss experience). Furthermore, Shapira and Venezia (1999) suggest the use of screening methods such as offering a set of contracts varying in prices and deductibles to induce self-selection of a contract appropriate for the potential insured risk-type. Therefore, the use of strategies such as screening could help micro-insurers limit adverse selection by providing access to information on the individual risks of the insured. The screening and monitoring of the insured could be quite costly for micro-insurers, therefore, the costs and benefits of these strategies have to be carefully considered by micro-insurance providers. The findings of Bryant and Prohm (2002) suggest that the 'gate-keeping function' of local group-type insurance arrangements can be effective in controlling adverse selection issues as well as reducing the costs of screening and monitoring. In a similar vein, Biener and Eling (2011) find that offering group policies could help reduce the problems of adverse selection in micro-insurance markets, and propose the use of co-operative (mutual) architecture.

3.7.2.2 Moral Hazard

Moral hazard arises from "hidden actions" of the insured. That is, when the purchaser of an insurance contract takes actions that impact on the probability of incurring an insurable loss and/or the size of that loss. This situation arises due to the inability of the insurer to perfectly observe the actions of the insured after insurance has been purchased (Arrow, 1963; Pauly, 1968). Cummins and Tennyson (1996) report that moral hazard exists in two distinctive forms. First, ex-ante moral hazard which relates to the risk

that indemnification through insurance discourages insured agents from spending on loss prevention measures, and ex-post moral hazard which relates to the risk of excessive (fraudulent) claims reporting by the insured. In a study of medical insurance in the US, Pauly (1968) observed that ex-post moral hazard is particularly evident in medical insurance as claims are highly dependent on decisions made by the patient and physician once the illness has occurred. He also found that individuals who purchase health care insurance tend to seek more (and more expensive) medical care due to the low marginal cost of insurance compared with funding medical bills privately. Furthermore, Cohen and Sebstad (2005) in their study of health care insurance in Africa report that individuals often perceive insurance as a prepayment scheme. As such, they do not use medical treatments to meet actual needs but use healthcare services in an attempt to expend the premium payments already made under the insurance policy.

Biener and Eling (2012) contend that ex-ante and ex-post moral hazard exists only to a minimal degree in life insurance because the event that triggers coverage is death, which is fairly transparent (e.g., verified by a death certificate) and thus gives the beneficiary of the insurance contract no clear informational advantage over the insurer. Furthermore, Pauly (1968) advocated the use of risk-sharing contractual devices such as deductibles and/or co-insurance to mitigate moral hazard problems. Prior studies (Brown & Churchill, 2000a, 2000b) also propose the use of third party proof requirements, mandatory policies as well as exclusions. In addition, Roth and Athreye (2005) identified agent-fraud and moral hazard issues in the study of a micro-life insurance scheme in India, and propose the use of exclusions for suicide in the first year as well as strict screening and monitoring of agents as effective control mechanisms.

3.7.2.3 Agency Costs

Agency costs are the direct and indirect costs of attempting to ensure that agents (i.e., managers), and other contracting constituents, such as insured policyholders, act in the best economic interests of principals (i.e., owners of

the insurance firm). In micro-insurance, information costs are the additional expenses incurred in reducing business costs such as adverse selection and moral hazard. Jensen and Meckling (1976) describe agency costs as the sum of monitoring costs incurred by the principal, bonding expenditures of agents plus the residual loss in the traded value of the corporation¹⁷. The two main types of agency problems which arise in the context of insurance transactions as a result of the separation of ownership and control are: manager-owner and policyholder-owner incentive conflicts (Mayers & Smith, 1981, 1982, 1988). Furthermore, prior studies (e.g., Eisenhardt, 1989; Fama & Jensen, 1983a, 1983b) demonstrate that owners may observe incentive issues with the agents (managers) they employ to manage and run their organisations, especially as those agents possess increasing levels of informational advantages over owners. Agency theory contends that managers are likely to pursue strategies and goals to meet their own utility. For example, managers might make less risky decisions given concerns about preserving their job security. Smith (1976) proposes that manager-controlled firms are more likely to maximize sales rather than profits, and engage in activities that smooth income. The excessive use of perks and sub-optimal decision-making of managers could adversely affect the overall profitability of the firm. Consequently, the shareholder-owners undertake costly mechanisms to monitor the behaviour of managers. Eisenhardt (1989) contends that the degree to which managers use their ability to maximise the wealth of the shareholder-owners is dependent on the percentage of equity ownership that they possess. Eisenhardt (1989) therefore argues that increasing insider-ownership could help align owner-manager incentives.

With regard to policyholder-owner incentive conflicts, agency theory holds that shareholders of insurance firms have incentives to expropriate wealth from the policyholders in order to increase the value of their residual claims in financial markets. This could be achieved by shareholders and their

¹⁷Jensen and Meckling (1976) define monitoring costs as the costs incurred by the principal in controlling the behaviour of agents – for example, through budget restrictions, compensation policies, operating rules and so on. Bonding costs refer to the incentives which the principal pays the agent to guarantee that he/she will not take actions which would harm the principal's interests – e.g., by using external auditors to scrutinize financial systems, or in the insurance context, by purchasing reinsurance (e.g., see Mayers & Smith, 1990). The residual loss is the dollar equivalent of the loss in the expected traded value of the firm experienced by the principal as a result of agency problems in incomplete markets.

managers increasing the risk on collateralised assets underpinning the liabilities of the insurance pool after insurance policies are sold. In such a situation, shareholders bear the upside risk (i.e., increased security returns) while policyholders bear the downside risk (i.e., the costs of bankruptcy) (MacMinn & Garven, 2000). Furthermore, shareholders-owners could decide to exercise their 'default put option' under limited liability rules and voluntarily liquidate the insurance firm in the event of asset depletion (e.g., arising from some unanticipated catastrophe or severe economic shock (MacMinn, 1987). Policyholders are primary fixed claimholders in stock insurers in that their claims have a specified value over a finite period and unlike mutual forms of organization they do not share in the profits of the company. Therefore, agency costs arise to optimize incentive contracts between the residual claims of owners of insurance firms and the fixed claims of policyholders. The policyholder-owner agency problems can be mitigated through contractual means (e.g., reinsurance), internal rules and procedures (e.g., governing investment policies), and/or by external regulation (e.g., prohibiting voluntary liquidation of insurance firms) (e.g., see Garven & MacMinn, 1993; Mayers & Smith, 1981, 1982, 1988).

Prior studies (e.g., see Fama & Jensen, 1983a, 1983b; Mayers & Smith, 1981) suggest that organizational form can be an effective control of agency problems and information asymmetries in insurance markets. These scholars hypothesize that due to inherent advantages in minimising agency problems (costs), certain ownership structures could effectively control the incentive conflicts inherent in the relationship between owners, managers and policyholders. For example, Mayers and Smith (1988) argue that by merging the owner-policyholder functions, mutual insurers (including friendly societies and co-operatives) are more effective in controlling the policyholder-owner agency conflicts than stock forms of organisation. Their *managerial discretion hypothesis* holds that in mutual-type organizations managerial decision-making is controlled by internal policies and procedures (e.g., actuarial rules) thereby inducing financially prudent decisions. Additionally, the lack of access to capital markets means that relative to their counterparts in stock insurance firms, the risk-averse behaviour of managers of mutual insurers is economically rational as an adverse shock has to be absorbed by internal

reserves and retained earnings rather than equity. This increases the risk of financial distress and/or bankruptcy. Prior studies (e.g., Mayers & Smith, 1981, 1982, 1988) further argue that because managerial activities in mutual companies will be controlled by internal procedures and rules, they will tend to predominate in less complex and risky lines of business (e.g., life insurance) that do not require high degrees of managerial discretion. On the other hand, Hansmann (1985) and Mayers and Smith (1988) predict that stock insurers are effective in controlling the owner-manager conflicts and are more likely to exist in segments of the insurance market (e.g., catastrophe lines) that require more managerial discretion in underwriting, investment and operating decisions. Furthermore, in advancing her *expense preference hypothesis*, Mester (1989) offers an alternative view by arguing that agency problems can be relatively more acute in mutual forms of organization because without the 'disciplining effect' of the market for corporate control the managers of mutual insurers are likely to increase the agency costs of operation (e.g., through excessive perquisite consumption and on-the-job shirking).

Stock and mutual forms of organization are the two most common forms of ownership structures. However, in many jurisdictions (including Nigeria and South Africa) variations in the type of ownership structure can also exist within the stock form of organization. For example, equity can be held by a few large (majority) investors, disparate individual investors, and/or by managerial-owners. Mayers and Smith (1994) examine the variation in operating characteristics across ownership structures of common stock insurance companies, and classify them into four main groups, namely: 'association-owned stock firms', 'mutual-owned stock firms', 'closely-held stock firms', and 'widely-held stock firms'. They argue that 'mutual-owned' stock firms are similar to conventional mutual insurance companies because the shareholders are also the policyholders of the association or the parent mutual. In large (particularly publicly listed) closely-held stock firms, there is often a merger of the manager and shareholder functions which helps to substantially reduce owner-manager conflicts but which might come at a cost for policyholders (e.g., as a result of excessive risk-taking). Closely-held stock firms can be further classified into 'closely-held stock firms owned by

managers' or closely-held stock firms owned by other investors' depending on the amount of equity held by insiders (managers). However, for widely-held stock insurance firms there is usually a clear separation of shareholder-manager-policyholder functions. He and Sommer (2010) examine a spectrum of ownership structures in the US property-liability insurance industry and find that the agency costs associated with owner-manager conflicts increase with the degree of separation and control. They come to similar conclusions as Mayers and Smith (1994) and contend that agency conflicts are most likely to be acute when widely-held ownership rights predominate. If left unchecked by contractual control and incentive alignment mechanisms, such a structure could increase agency problems (costs) in the firm. Leech and Leahy (1991) contend that due to the complete separation of ownership and control in widely-held firms, there is no individual or group incentive to exercise control and enforce profit maximization. Furthermore, Cummins and Sommer (1996) argue that owner-manager conflicts are expected to be smallest in closely-held firms by managers and largest in widely-held firms with closely-held firms owned by others providing an intermediate case. Ke, Petroni, and Safieddine (1999) in a study of the executive compensation structure in US insurance firms find a positive association between firm performance and the level of compensation for widely-held (public) insurers but not for closely-held-private insurers. They further argue that shareholder-owners of closely-held firms have more incentives to proactively monitor the activities of managers than their counterparts in firms with more disparate shareholdings.

The empirical results of prior research on the influence of ownership structure on firm performance has been theoretically complex, empirically ambiguous, and subject to continuous debate since the pioneering work of Berle and Means (1932) who first proposed an inverse correlation between the diffuseness of shareholdings and firm performance. Using accounting profit as a measure of performance, Demsetz and Lehn (1985) provided a conflicting view from the argument of Berle and Means (1932) and posit that ownership structure should be regarded as an endogenous outcome of decisions that reflect the influence of shareholders and the market for traded shares. On the other hand, Morck, Shleifer, and

Vishny (1988) proposed a curvilinear association between managerial ownership and firm performance using both the accounting profit and Tobin's Q. Furthermore, Demsetz and Villalonga (2001) examine two aspects of ownership which are likely to represent conflicting interests - the managerial ownership and the percentage of the five largest shareholding interests. They find no evidence to support the notion that variation across firms in observed ownership structures result in systematic variations in firm performance. Oswald and Jahera (1991) obtained a positive relation between the levels of insider ownership and excess stock returns. They contend that a higher level of insider ownership implies improved decision making, thus supporting the notion that the strategy of increasing the vested interests of managers is beneficial to the long-term performance of the firm. In a similar vein, Chaganti and Damanpour (1991) examine the influence of institutional ownership on firm performance, and find that the strength of the relation between the institutional ownership and performance depends on the degree of managerial ownership. Mehran (1995) in a study of the executive compensation structure in US manufacturing firms, propose that the use of compensation contracts can be one of the major ways to mitigate owner-manager agency conflicts in firms. He found that firm performance is positively related to both the percentage of equity held by managers and the percentage of their total compensation that is equity-based.

3.7.3 Financial Leverage

The incentive conflicts between the managers and owners of firms' as discussed in the preceding section, provides the basis for the agency cost theory. Jensen and Meckling (1976) proposed that due to the separation of ownership and control in firms, managers tend to pursue their own utility-maximising strategies rather than promoting shareholder wealth. The use of debt in the capital structure of firms has been identified as one of the ways to mitigate the loss from the owner-manager agency conflicts as the residual claim of managers in a firm rises with increasing level of debt (Harris & Raviv, 1990, 1991). The 'free-cash flow hypothesis' of Jensen (1986) stipulates that the pressure to generate cash-flows to meet debt obligations,

reduces the amount of free-cash available to managers to pursue self-utility maximising objectives. Jensen (1986) argues that the threat of a failure in meeting debt repayments serves as an effective motivating force for managers to be efficient. In a similar vein, Stulz (1990) argues that owner-manager conflicts arise in operating and investment decisions, as managers prefer to invest all available funds (i.e., over-investment) even if shareholder-owners prefer cash payouts in the form of dividends. The empirical findings of Stulz's (1990) study indicate that the repayment of debt schedules reduces the amount of free-cashflow available to managers to invest in self-utility maximizing projects.

Harris and Raviv (1990) and Williamson (1988) also provide support for the use of debt in mitigating the owner-manager agency conflicts. They contend that managers prefer to continue operations in the face of bankruptcy even if the shareholder-owners prefer liquidation. However, debtholders have the option to force liquidation if cashflows are poor and subsequent debt repayments fail to be made. Grossman and Hart (1982) also propose that in widely-held corporations, high levels of debt in the capital structure could serve as a disciplinary device to reduce managerial free-cashflow waste through the threat of liquidation. Furthermore, Margaritis and Psillaki (2010) in a study of a sample of low and high growth French firms find that a positive relation between leverage and improved efficiency in line with the 'free-cashflow' hypothesis of Jensen (1986). Similarly, Adams and Buckle (2003) in their investigation of the Bermuda insurance market find that highly leveraged firms have better operational performance than lowly-leveraged firms.

The agency costs of debt also arise from incentive conflicts between shareholder-owners and debt-holders at high levels of indebtedness especially when there is a risk of default. Myers (1977) in explaining the 'underinvestment' or 'debt-overhang' problem contends that the issue of risky debt reduces the present market value of the firm. The underinvestment problem particularly arises in highly levered states when an unexpectedly severe loss to collateralised assets motivates owners of the firm to exercise their 'default put option' under limited liability rules and so avoid

reinstating lost or impaired productive assets. Owners of firms are motivated to undertake this action because the future economic benefits of post-loss asset reinstatement are perceived to accrue largely to fixed-claimants (e.g., debt-holders) rather than themselves as residual risk-bearers. Stulz (1990) further argues that at high leverage levels, the debt repayment may outweigh the free-cash flow available to managers, thus reducing the funds available for profitable investments. Furthermore, Jensen and Meckling (1976) contend that high leverage could also lead to the problems of 'asset substitution' which arise out of the agency conflicts between shareholder-owners and debt-holders. They argue that shareholders have incentives to choose prospectively risky projects as they benefit from the upside risk of increased returns while the debt-holders bear the downside risk of bankruptcy costs. Williamson (1988) contends that at high debt levels, the inflexibility of the rules which gives debt-holders the option to force liquidation could result in the 'forced-sale' of firms' assets when they are more valuable. Harris and Raviv (1990) describe the agency costs of debt as the investigation costs employed in determining the value of the firm during the liquidation decision. There is a trade-off between the liquidation value and investigation costs. Hence, firms with higher liquidation value and lower investigation costs are likely to be highly levered. In most firms, the optimal structure is determined by trading-off the benefits versus the costs of debt. Therefore, high leverage could have both a positive and negative effect on firm performance. The extant literature on capital structure confirms that increases in leverage will lead to an increase in firm value up to an optimum point beyond which further increases in leverage reduces the firms' value (Purnanandam, 2008).

3.7.4 Reinsurance

The agency costs of debt which arise from incentive conflicts between contracting constituents (i.e., shareholders, managers, debtholders) is one of the objectives for the corporate purchase of reinsurance (Mayers & Smith, 1990). Smith and Stulz (1985) show that value maximizing firms' hedge because of taxes, costs of financial distress and managerial risk aversion to

job loss in event of solvency. Indeed, risk hedging via the purchase of reinsurance could also help reduce expected taxes, expected costs of bankruptcy, and allow the ceding insurer access to the services and technical expertise of the reinsurer (Berger , Cummins, & Tennyson, 1992; Garven & Lamm-Tennant, 2003; Mayers & Smith, 1982, 1990) The underinvestment problem first analysed by Myers (1977) in which managers reject positive net present value (NPV) projects due to the conflicts of interest between shareholder-owners and debtholders could also be alleviated through the use of reinsurance (Mayers & Smith, 1987).

The results of prior research (e.g., see Adams, 1996; Adams, Hardwick, & Zou, 2008; Cole & McCullough, 2006; Garven & Lamm-Tennant, 2003; Shiu, 2011) indicate that the purchase of reinsurance is positively associated with leverage which is consistent with the expected bankruptcy cost argument and agency costs theory. Adams (1996) in the examination of the relation between reinsurance and firm-specific factors in the New Zealand life insurance industry finds that reinsurance is associated with smaller and more highly leveraged firms. His analysis supports the 'risk-bearing' hypothesis which suggests that insurers tend to reinsure more to alleviate the risk of severe loss as their leverage levels gets close to solvency constraints. Furthermore, Garven and Lamm-Tennant (2003) demonstrate that the demand for reinsurance is positively related to insurers' leverage. They contend that the use of reinsurance reduces the effects of large unexpected losses and increases the probability the insurer would benefit from investment in tax-favoured assets (e.g., rental real estate). Shiu (2011) investigates the effects of capital structure on the purchase of reinsurance in the UK non-life insurance industry, and finds that insurers with a higher level of leverage tend to reinsure to reduce the probability of insolvency and mitigate the agency costs arising from the conflicts between policyholders and shareholder-owners. Powell and Sommer (2007) examine the internal and external sources of capital through the investigation of the reinsurance activity between affiliated and unaffiliated insurers. They find that leverage has a positive impact on both internal and external reinsurance. Adams et al. (2008) in the investigation of the factors affecting the incremental use of reinsurance in UK life insurance firms find that insurers with higher leverage

tend to purchase more reinsurance than less leveraged insurers. On the other hand, Cole and McCullough (2006) in the examination of the overall demand for reinsurance as well as the utilisation of foreign reinsurance by US insurers, find that insurers with lower leverage are associated with the use of foreign insurance but document no significant relation between the overall demand for reinsurance and leverage. In addition, Hoerger, Sloan, and Hassan (1990) find that the decision of an insurance firm to purchase reinsurance is influenced by the probability of bankruptcy. They contend that the purchase of reinsurance shifts some of the portion of the insurer's risk to the reinsurer thus reducing the expected costs of bankruptcy. Consistent with the findings of previous studies, Carson and Hoyt (1995) also find that in the US life insurance industry higher levels of leverage are associated with an increase in the probability of bankruptcy. Using the ratio of direct business written to surplus as a measure of leverage, they posit a positive association between leverage and the demand for reinsurance. Adiel (1996) further contends that reinsurance is crucial for primary insurers as it helps to increase insurer capital and earnings and reduce regulatory costs.

Despite the beneficial effects of reinsurance in reducing the agency costs of debt, expected taxes and expected costs of bankruptcy, the purchase of reinsurance could be costly for the ceding insurer. Jean-Baptiste and Santomero (2000) contend that reinsurance reflects both the riskiness of the primary insurer's policies that are being reinsured as well as the reinsurer's perception regarding the true quality of the insurer's business. They demonstrate that the insurer has more information than the reinsurer regarding the risk being transferred as well as control over the ultimate outcome of the risk. This leads to higher reinsurance premiums which could lower the expected profit of the ceding insurer and so lower the quantity of reinsurance purchased. Doherty and Garven (1995) contend that the purchase of reinsurance can be costly for primary insurance writers (e.g., in terms of brokerage fees and ceded premiums).

In micro-insurance, reinsurance serves as an important risk management tool to stabilize irregular claims patterns and also as a source of technical expertise for the insurer. In particular, most micro-insurers in Sub-Saharan

Africa are operating at a small to medium scale due to the lack of risk capital and limited access to cost effective reinsurance insurance (Olaosebikan, 2013). Reinsurance provides micro-insurers with the capacity to expand and build sustainable operations as well as the technical expertise to deal with issues such as lack of data, control of adverse selection, moral hazard and fraud which are prevalent in the low income market (Swiss Re, 2010). In addition, Lloyd's of London (2009) emphasise the importance of reinsurance in capacity building, and product development especially for small micro-insurance schemes. However, the role of reinsurance has been found to be relatively limited as most commercial micro-insurers argue that due to the low sums assured, significant losses might not surpass the deductibles under reinsurance agreements (Churchill & Matul, 2012). Prior studies (e.g., Brown & Churchill, 2000a; Brown & Churchill, 2000b) examine the current state of the micro-insurance market using evidence from MFIs, cooperatives, private companies and other organisations with micro-insurance products. They highlight the importance of reinsurance in improving the growth prospects of micro-insurers, stabilizing financial results, providing protection against catastrophic losses, improvement of underwriting expertise, and management of sub-standard risks. They further highlight the importance of reinsurance in opening up the low income market for mass covariant risks such as natural disasters that could otherwise be uninsurable. Olaosebikan (2013) in her study of micro-life insurers in Nigeria obtained a negative association between the purchase of reinsurance and profitability. This suggests that the cost of reinsurance might be highly priced to reflect the increased risk associated with insuring the lives of low income groups. McCord et al. (2005) in a study of a group personal accident micro-insurance product developed by a local MFI and the American International Group (AIG) in Uganda, found minimal use of reinsurance. They contend that the low level of reinsurance usage is due to the small sums assured and the relatively widespread exposures which limit the potential for huge losses. Despite the minimal use of reinsurance, the micro-insurance product assisted the participating MFI to generate revenue and improve loan portfolio quality. The product was also reported as the main generator of revenue and profits for the AIG Uganda partner. The substantial technical expertise received by the MFI from AIG subsidiary in Uganda was crucial to the success of the

scheme. Therefore, the study demonstrates that micro-insurers may not necessarily require significant amount of reinsurance for risk mitigation. Indeed, the regulatory requirements for micro-insurance providers to hold such 'costly' reinsurance may result in a loss of profitability.

3.8 Summary and Conclusion

This chapter reviews the theoretical and empirical literature on micro-insurance. It examines the origin, definition and characteristics of micro-insurance products as well as the common micro-life insurance product types. The chapter further reviews the extant literature on transaction costs, information asymmetry (adverse selection and moral hazard), agency costs, leverage and reinsurance. As highlighted in chapter 1, section 1.1, the existing literature on micro-insurance highlight the key features of the micro-insurance market as well as the supply and demand side factors affecting the business success and /or the increased take up of micro-insurance in developing countries. However, broader empirical and quantitative studies on the business success of micro-insurers remain limited (Koven and Zimmerman, 2011). The present study seeks to address the gap in literature by examining the quantitative factors that drive the business success/profitability of commercial micro-life insurers. In particular, the present study differs from prior micro-insurance literature (e.g., Biener and Eling, 2011) because the focus is on the assessment of the profitability of commercial micro-'life' insurance providers operating in Nigeria and South Africa. In addition, the study employs a larger dataset and draws intuitions from the agency theory/information asymmetry literature to build a theoretical framework on the determinants of profitability. Furthermore, the present study differs from prior research because it utilises the two main frontier efficiency techniques (i.e., DEA and SFA) in the estimation of cost efficiency and hypothesises that that the ability of the managers of micro-life insurance firms in controlling transaction costs is crucial to profitability. The insights drawn from the review of literature in this chapter is employed in developing the research hypotheses put forward next in chapter 4 of this thesis.

Chapter 4

Hypotheses Development

4.1 Introduction

This chapter draws insights from the review of literature carried out in chapter 3 of the thesis, and derives four main hypotheses to guide the empirical testing carried out in chapter 6. The lack of sufficient high quality data on the risks underwritten, severe information asymmetries associated with adverse selection and moral hazard (including fraudulent claims), high transaction costs in delivery and claims administration, regulatory constraints and inadequate risk pooling capacity and technical expertise are factors impeding the growth of micro-insurance in developing countries (e.g., see Koven & Zimmerman, 2011). Based on the review of theoretical and empirical literature, the determinants of the business success of micro-life insurance firms is hypothesised to be primarily dependent on the managerial success in reducing market imperfections (e.g., information asymmetries and transaction costs) and building capacity to realize economies of scale. The test hypotheses and their motivation are outlined below.

4.2 Cost Efficiency

The high transaction costs in the management of large amount of small policies have been identified as one of the key factors that affect the sustainability of micro-insurance schemes in sub-Saharan Africa (Swiss Re, 2010). Given that the micro-insurance industry in developing countries is characterised by low premiums, it is hypothesised that cost efficiency may be one of the main drivers of profitability. Recent micro-insurance studies (e.g., Biener & Eling, 2011, 2012; Olaosebikan, 2013; Olaosebikan & Adams, 2013) stress the importance for micro-insurers to realize scale economies from high volume product sales and other resource input efficiencies (e.g.,

from the use of new technology) in order to realize sustainable profitability. Greene and Segal (2004) obtained a negative association between cost inefficiency and profitability. They contend that cost inefficiency which is substantial relative to earnings, may be the main driver of profitability. In a similar vein, Choi and Weiss (2005) find that cost efficiency is positively associated with profitability. They contend that cost efficient firms are more profitable because they are able to charge lower prices than their competitors. Therefore, the first hypothesis is that:

H1a: Other things being equal, a positive relation between cost efficiency and the profitability of micro-life insurers is likely to exist.

Berger and Humphrey (1997) highlight that the cost efficiency incorporates both the technical and allocative efficiency estimate. Technical efficiency reflects the ability of a firm to obtain maximum outputs from a given set of inputs while allocative efficiency reflects the ability of a micro-life insurer to use inputs in optimal proportions given their respective prices. Thus, the efficiency of a micro-life insurer in terms of production/service technology and resource allocation will have a significant impact on profitability. Accordingly:

H1b: Other things being equal, a positive relation between technical efficiency and the profitability of micro-life insurers is likely to exist.

H1c: Other things being equal, a positive relation between allocative efficiency and the profitability of micro-life insurers is likely to exist.

4.3 Ownership Structure

Ownership structure can be an effective control of agency problems and information asymmetries in insurance markets as it can moderate the incentive conflicts inherent in the relationship between owners, managers and policyholders (Mayers & Smith, 1982, 1994). Thus, the ownership

structure of a firm can play a significant role in the determination of a firm's profitability. However, the empirical results of prior research (e.g., see Chaganti & Damanpour, 1991; Demsetz & Lehn, 1985; Demsetz & Villalonga, 2001) on the impact of ownership structure on firm performance have been ambiguous and inconsistent. For example, Demsetz and Lehn (1985) contend that ownership structure should be regarded as an endogenous outcome of decisions that reflect the influence of shareholders and the market for traded shares. On the other hand, Demsetz and Villalonga (2001) examine two aspects of ownership which are likely to represent conflicting interests - the managerial ownership and the percentage of the five largest shareholding interests. They find no evidence to support the notion that variation across firms in observed ownership structures result in systematic variations in firm performance. Other studies (e.g., Ligon, Thomas, & Worrall, 2002; Paal & Wiseman, 2011) suggest that local mutual/cooperative-type organizations are particularly apt in the context of micro-insurance in developing countries. This is because mutual forms of organization provide close ex-ante control over the entry of new policyholders to the insurance pool (e.g., through the application of strict underwriting criteria) and introduce ex-post controls to minimize aberrant behaviour by existing policyholders and managers (e.g., in the form of contractual mechanisms). Therefore, mutual forms of insurance organisation can be especially effective in mitigating adverse selection and moral hazard problems, and reducing the agency cost of ex-post monitoring and contractual enforcement. Given the ownership forms observed in the Nigerian and South African micro-insurance sector, the effect of a continuum of shareholding (stock)-types in reducing information asymmetry and agency problems is the focus of analysis. The ownership structures examined include public (widely-held)¹⁸ and private (closely-held) stock firms. In addition, the variation in private (closely-held) stock firms (i.e. closely-held by 'managers', closely-held by banks and closely-held by others such as insurance companies, financial companies, and mutual funds) is also examined.

¹⁸ Following Barry, Lepetit, and Tarazi (2011), public (widely-held) stock micro-life insurers are defined as those entities whose shares are listed on the main domestic stock exchange, while private (closely-held) stock firms are all other micro-life insurers owned by shareholders.

Mayers & Smith (1994) argue that for closely-held stock insurance firms, tighter monitoring and control of managerial activities by owners reduces information asymmetry and agency costs thus increasing the market value of the firm. For, public (widely-held) stock insurers less stringent monitoring and control of managers by shareholders leads to higher agency costs compared with closely-owned entities. Cummins and Sommer (1996) further contend that owner-manager conflicts and associated agency costs are expected to be smallest in closely-held firms and largest in widely-held firms. Leech and Leahy (1991) contend that there is no individual or group incentive to exercise control and enforce profit maximisation in widely held firms due to the complete separation of ownership and control. Additionally, He and Sommer (2010) posit that the agency costs associated with owner-manager conflicts increases with the degree of separation of ownership and control. They contend that the owner-manager conflicts and agency costs are likely to be acute when widely-held ownership rights predominate. As a result the second hypothesis is that:

H2a: Other things being equal, private (closely-held) stock micro-life insurers are likely to be more profitable than public (widely-held) stock micro-life insurers.

For public (widely-held) stock firms there tends to be greater separation of ownership and control, as ownership is dispersed among a large number of shareholders (Barry et al., 2011). Mester's (1989) *expense preference hypothesis* implies a different perspective on the profitability-effect of ownership structure by arguing that agency costs can be relatively more acute in closely-held stock (privately-owned) firms rather than widely-held (publicly traded) firms. This is because without the 'disciplining effect' of an active market for corporate control, the managers of closely-held stock insurers are likely to increase agency costs (e.g., through excessive perquisite consumption and on-the-job shirking) especially in situations where the level of inside (managerial) ownership is low. Consistent with the optimal contracting theory, (Ke et al., 1999) find a positive association for the level of compensation and firm performance in public (widely-held) firms.

They contend that there is less need of the use of costly mechanisms in monitoring the activities of managers in widely held firms compared to closely-held firms. As a result:

H2b: Other things being equal, public (widely-held stock) micro-life insurers are likely to be more profitable than private (closely-held) stock micro-life insurers.

Mayers and Smith (1994) argue that the closer the merger of the owner-manager functions, the lower the agency costs of monitoring and control. Owner-managers are also motivated to take decisions that increase period profitability and increase the value of their ownership stake in the firm. Cummins and Sommer (1996) further contend that the owner-manager conflicts and subsequent agency costs are expected to be smallest in closely-held firms owned by managers and largest in widely-held firms with closely-held owned by others providing an intermediate case. He and Sommer (2010) suggest that the degree of separation and control and subsequent agency costs is smallest in firms closely-held by managers. Therefore, for the two classes of closely-held stock insurers, the agency costs of monitoring and control are expected to be relatively higher in micro-insurers with closely-held stock held by large investors (banks) than in micro-insurers that are closely-held by management. As a consequence:

H2c: Other things being equal, micro-life insurers with closely-held stock owned by management are likely to be more profitable than micro-life insurers that have closely-held stock owned by large banks.

On the other hand, micro-insurers with closely-held stock owned by banks could be more profitable than micro-insurers with closely-held insider shareholdings because bancassurers could have inherent economic advantages compared with management-owned entities. For example, banks tend to have extensive distribution networks that enable their micro-insurance subsidiaries to develop a large and diversified customer-base

(Angove & Tande, 2011). Shleifer and Vishny (1986) contend that large (non-management) shareholder-owner of firms could serve as effective monitors of managers because they have lower marginal cost of acquiring and disseminating information. Furthermore, the information asymmetry problems (i.e., moral hazard and adverse selection) could also be substantively reduced for micro-insurers that are closely-held by banks due to their ability to accurately access the creditworthiness of micro-customers from records held by the parent banking corporation (Olaosebikan & Adams, 2013). Accordingly:

H2d: Other things being equal, micro-life insurers with closely-held stock owned by banks are likely to be more profitable than micro-life insurers with closely-held stock owned by management.

4.4 Leverage

The impact of the capital structure on firm performance has been well documented in literature (e.g., see Adams & Buckle, 2003; Myers, 1977; Stulz, 1990). The use of debt financing has been identified as one of the ways to reduce the owner-manager agency conflicts as the residual claim of managers rises with the increasing use of debt (Harris & Raviv, 1991). Insurance company managers also realize 'tax shield benefits' from increasing leverage thus enhancing annual reported profits (Adams et al., 2008). The *free cash flow hypothesis* of Jensen (1986) suggests that high leverage levels can actually be value-enhancing for firms as the obligation to meet the repayment schedules under debt agreements disciplines managers to act in ways consistent with the strategic goal of maximizing shareholders' wealth. In a similar vein, Grossman and Hart (1982) contend that high debt ratios may be used as a disciplinary device to reduce managerial cash flow waste through the threat of liquidation. Furthermore, Stulz (1990) argue that the use of debt helps mitigate the overinvestment problem which arises when managers expend the firm's free-cashflow on self-utility maximizing projects. Harris and Raviv (1990) and Williamson (1988) also demonstrate that leverage could alleviate the owner-manager conflicts by giving

debtholders the option to force the liquidation of the firm when in extreme financial distress. Margaritis and Psillaki (2010) argue that high leverage is associated with improved firm efficiency in line with the agency cost hypothesis of Jensen and Meckling (1976). Adams and Buckle (2003) also contend that highly leveraged firms have better operational performance than lowly-leveraged firms. Additionally, Purnanandam (2008) finds that in the absence of legislative restrictions and tight regulatory monitoring and control (which apply to the Nigerian and South African micro-insurance markets) high leverage can actually induce excessively risky behaviour by shareholders and their managers (particularly if executive earnings-based incentive compensation plans are in place) thus increasing 'upside abnormal' profits. Therefore, the third main hypothesis is that:

H3a: Other things being equal, a positive relation between leverage and the profitability of micro-life insurers is likely to exist.

On the other hand, Stulz (1990) predicts that the use of debt could have both a positive or negative effect on firms' performance. He argues that at high leverage levels, the increased need to meet the repayments under debt schedule could outweigh the free cash flow available to managers for profitable investments. Myers (1977) contends that high leverage could have a negative impact on performance of firms with abundant growth opportunities due to the underinvestment problem which arises when there is risk of default. Furthermore, Jensen and Meckling (1976) posit that at high leverage levels, the agency incentive conflicts between shareholders-owners and debtholders which leads to the problems of asset substitution could also lead to a reduction in firm value. Williamson (1988) further adds that the flexibility of the rules which give debtholders the option to force the liquidation of the firm at high debt levels could also have a negative impact on the traded value of firms. Consequently, an alternative to the third hypothesis is that:

H3b: Other things being equal, a negative relation between leverage and the profitability of micro-life insurers is likely to exist.

4.5 Reinsurance

Prior empirical research (e.g., Berger et al., 1992; Garven & Lamm-Tennant, 2003; Mayers & Smith, 1982, 1990) demonstrate that the purchase of reinsurance could help to mitigate the risk and costs of bankruptcy, reduce expected taxes, and provide technical expertise for the primary insurer. In particular, the importance of reinsurance in the success of micro-insurance initiatives has also been emphasised by previous studies (Brown & Churchill, 2000a, 2000b; Dror & Armstrong, 2006; Lloyd's of London, 2009). However, access to reinsurance in developing countries can often be limited and/or costly for primary insurance writers thus limiting their profitability (Olaosebikan, 2013). Insurers can manage their capital position and improve balance sheet strength (thus mitigating insolvency risk and the political costs of regulatory intervention) not only by increasing equity but also by transferring part of their liabilities for assumed risks to third party reinsurance companies (Adiel, 1996; Hoerger et al., 1990). The purchase of reinsurance by primary insurance carriers could also help to mitigate the underinvestment problem which arises due to the agency cost of debt, as well as the expected bankruptcy costs, thus contributing to sustainable profitability (Adams, 1996). Furthermore, reinsurance can lower expected taxes by reducing the variability of future earnings and so contribute to the traded value of insurance firms (Adams et al., 2008; Garven & Lamm-Tennant, 2003). The purchase of reinsurance has also been identified as one of the vital links in the sustainability of micro-insurance schemes in times of environmental disasters and economic shocks (Dror & Armstrong, 2006). In addition, the findings of McCord et al. (2005) demonstrate that the technical expertise of reinsurers in dealing with issues of lack of data, control of information asymmetry problems and fraud is invaluable to the sustained growth and profitability of micro-insurance schemes. Therefore, the fourth main hypothesis is that:

H4a: Other things being equal, the level of reinsurance of micro-life insurers is likely have a positive impact on profitability.

On the other hand, Jean-Baptiste and Santomero (2000) contend that information asymmetry regarding the quality of the insurer's business as well as riskiness of the policies ceded is reflected in the high cost reinsurance premiums which could lower the expected profit for the insurer. (Doherty & Garven, 1995) report that the purchase of reinsurance is costly for primary insurance writers (e.g., in terms of brokerage fees and ceded premiums) and thereby reduces profitability and the market value of insurance firms. Furthermore, Olaosebikan (2013) found a negative relation between profitability and the level of reinsurance in the Nigerian micro-life insurance market and suggests that reinsurance may be highly priced to reflect the increased risk associated with providing micro-life insurance coverage to low income groups. This reasoning implies that:

H4b: Other things being equal, the level of reinsurance of micro-life insurers is likely have a negative impact on profitability.

4.6 Interaction Term (Reinsurance x Leverage)

Prior research (e.g., see Adams, 1996; Adams, Hardwick, & Zou, 2008;; Garven & Lamm-Tennant, 2003) highlight the importance of reinsurance in reducing the expected costs of bankruptcy induced at high leverage. Adams (1996) finds that the increasing use of reinsurance is associated with highly leveraged firms in line with the 'risk-bearing' hypothesis which suggests that insurers tend to reinsure more to alleviate the risk of severe loss as their leverage levels gets close to solvency constraints. In addition, Garven and Lamm-Tennant (2003) contend that the use of reinsurance reduces the effects of large unexpected losses and increases the probability the insurer would benefit from investment in tax-favoured assets. Shiu (2011) finds that insurers with a higher level of leverage tend to reinsure to reduce the probability of insolvency and mitigate the agency costs arising from the conflicts between policyholders and shareholder-owners. Adams et al. (2008) in the investigation of the factors affecting the incremental use of reinsurance in UK life insurance firms find that insurers with higher leverage

tend to purchase more reinsurance than less leveraged insurers. Therefore, the fifth main hypothesis is that:

H5: Other things being equal, a positive relation between the interaction term (reinsurance x leverage) and the profitability of micro-life insurers is likely to exist.

4.7 Summary and Conclusion

This chapter has presented the main test hypotheses derived from the review of literature in chapter 3. The determinants of the profitability of micro-life insurers has been described as the managerial success in reducing market imperfections (e.g., information asymmetries and transaction costs) and building capacity to realize economies of scale. The hypotheses outlined in this chapter thus provide the foundation for the empirical analysis conducted in chapter 6 of the thesis. The procedure for conducting the empirical analysis is described next in chapter 5.

Chapter 5

Research Design

5.1 Introduction

This chapter introduces the sample data, defines the main variables, and specifies the models employed in the empirical analysis. Specifically, the chapter describes frontier estimation techniques – SFA and DEA employed in a first-stage computation of the cost efficiency estimates. It also describes the feasible generalised least squares (FGLS) model employed in the second-stage regression analyses to test the research hypotheses put forward in chapter 4.

5.2 Data Sources and Description

The data employed to test the hypotheses put forward in the preceding chapter are obtained from the annual financial statements of (micro) life insurance firms in Nigeria and South Africa. For Nigeria, annual data are compiled by the NIA and submitted to the insurance industry regulator – the NIACOM. For South Africa, annual data are filed with the local insurance industry regulator – the FSB. In cases where information on micro-life insurance business could not be identified from published sources, data were then obtained directly from internal company sources through authorized direct access and/or by interview with technical managers. There is currently no specific regulation for micro-insurance in Nigeria and South Africa¹⁹, therefore life insurers are not mandated to hold separate data for micro-

¹⁹Although micro-insurance regulation has not been implemented for both countries, there is an 'unofficial' definition for micro-insurance provision. For example, In South Africa, based on the requirements of the FSC charter, micro-insurance is usually defined as products targeted to the LSM 1-5 (low income population) which commercial (formal) insurance providers have to report (though not compulsory) in their annual statements. For Nigeria, micro-insurance products are usually characterized by low premiums (usually around US \$6 per month) and low sums assured.

insurance activities. Hence, commercial insurers have not formally monitored the costs associated with developing and writing their micro-insurance operations. Therefore, in cases where the required data, especially on expenses, are unobtainable through published sources and /or interviews, the present study makes assumptions around the allocation of expenses due to the difficulty in directly assessing the actual expenses of the micro-life insurance business. As in Angove and Tande (2011) the proportional method of expense allocation which assumes that the cost of writing the micro-life business is proportional to the premium income generated is employed. Appendix A presents the comparison of the observed/actual expenses versus estimated expenses for the eleven Nigerian micro-life insurers who reported the expenses on their micro-insurance business. As expected, the actual expenses are on average 11 percent higher than the estimated expenses. This difference reflects the high transaction costs associated with micro-insurance, and suggests that the expenses incurred on the micro-life insurance business are on average higher than the premium income generated. However, given the lack of data, the proportional method of expense allocation is applied for the micro-life insurers for which the data on expenses is not available. With the penetration/growth of micro-insurance and the introduction of micro-insurance regulation, it is hoped that future research will be able to more accurately monitor expenses in order to better understand the profitability and commercial viability of micro-life insurance.

The sample data were obtained for Nigerian and South African micro-life insurers over six years - 2005 to 2010. There were a number of mergers and acquisitions in the Nigerian insurance industry in 2007, which was triggered by a consolidation exercise conducted by NAICOM. The exercise resulted in the reduction of life insurers from 52 firms in 2005 to 26 firms by 2010. For South Africa, the number of life insurers over the sample period increased from 67 firms in 2005 to 76 firms by 2010. It should be noted that not all the Nigerian and South African life insurers offered micro-life insurance products and so the data set had to be 'trimmed' to include only those life insurers offering micro-insurance products. The micro-life insurance firms for which financial data were obtained for both countries were all stock forms of organization. Furthermore, the combined data set consisting of both Nigerian

and South African micro-life insurers were further 'cleaned' by eliminating firms with less than three years of continuous data in order to conduct an effective panel data estimation from which to derive reliable and robust results. As in Weber (2010), the Bacon technique for detecting outliers in a multivariate dataset was employed to identify any outliers in the data sample. The sample 'filtering process' identified 31 micro-life insurance providers for Nigeria and 30 micro-life insurance providers for South Africa resulting in an unbalanced panel of 303 firm-year observations consisting of 141 firm-year cases for Nigeria and 162 firm-year observations for South Africa. To ensure the comparability of all monetary values the annual financial data for each country were converted to US dollars at the prevailing end-of-year exchange rates and deflated by the consumer price index to the base year 2005 (e.g see, Biener & Eling, 2011; Cummins & Zi, 1998). The annual country-specific consumer price indices for Nigeria and South Africa were obtained from the latest published financial statistics of the IMF.

5.3 Frontier Efficiency Estimation

Frontier efficiency methodology is a class of benchmarking techniques which estimate the operating performance of a firm relative to "best practice" efficiency frontiers derived from leading firms in the industry. Frontier efficiency methodology has long been applied in the academic literature and also by financial institutions (e.g., banks and insurance firms) because it summarises firm performance in a single statistic that controls for differences among firms using a multidimensional framework (Cummins & Weiss, 2000). The use of the frontier analysis enables researchers and/or individuals to determine the 'best practice' firms within the industry, assign numerical efficiency values and identify areas of input overuse and/or output underproduction. The concept of economic efficiency arises from the micro-economic theory of the firm (Coelli, 1996). The production frontier is the most basic concept of economic efficiency which indicates the minimum amount of input required to produce any level of output for a firm operating with a single unit of input and output (Cummins & Weiss, 2000). The

pioneering work of Farrell (1957) which considers multiple inputs in the measurement of firm efficiency is recognised by most scholars to be the precursor of modern efficiency measurements. He proposed that the efficiency of a firm consists of two parts: First, technical efficiency which reflects the ability of a firm to obtain maximum output from a given set of inputs; and second, allocative efficiency which reflects the ability of the firm to use the inputs in optimal proportions given their respective prices. The combination of the two components gives rise to *economic efficiency or cost efficiency*. Farrell (1957) demonstrated his concepts of modern efficiency using two approaches: the input-oriented measures and the output-oriented measures.

The input-oriented measure for technical efficiency indicates the amount by which input quantities can be reduced without changing the level of output quantities produced while the output orientated measures of efficiency indicates the amount by which output quantities could be proportionally expanded without altering the input quantities employed (Coelli, 1996). Färe and Lovell (1978) demonstrate that the measures for technical efficiency computed using the constant returns to scale (CRS) specification model provides the same value for both input and output-orientations. However, the values obtained using the assumption of variable returns to scale (VRS) results in unequal values for the input and output orientated measures of technical efficiency (see section 5.3.1). Coelli and Perelman (1999) contend that the choice of orientation has only a minor influence of the efficiency scores obtained and that the choice of the appropriate orientation depend on the quantities (i.e., input or output) in which managers have the most direct control. The present study employs the input orientated measure in the estimation of technical efficiency because the input quantities, and in particular, the price of input quantities is the primary decision faced by the managers of micro-life insurance firms.

The two primary methodologies for estimating efficiency are the linear programming (DEA) approach and the econometric (SFA) approach. The costs and benefits of both techniques are emphasised by the adherents of each approach and there is no consensus on the preferred choice of

estimation methodology (see Eling & Luhn, 2010a for a detailed review of relevant literature). The two methods differ primarily on the degree of restriction imposed on the 'best practice' frontier and the distributional assumptions imposed on the random error and inefficiency.

5.3.1 Linear Programming (DEA) Approach

DEA is a linear programming technique developed by Charnes, Cooper, and Rhodes (1978) and subsequently revised by Banker, Charnes, and Cooper (1984) amongst others. DEA is the most widespread mathematical programming approach employed in the estimation of production, cost and revenue frontiers and provides an efficient way of decomposing efficiency into its components (Coelli, 1996). With DEA, the frontier is formed as the piecewise linear combinations that connect the set of best practice observations thus yielding convex production possibilities set (Berger & Humphrey, 1997). The DEA approach imposes less structure on the specification of the 'best practice' and does not decompose the inefficiency and error terms. The deviations of the observed firms from the frontier are all attributed to inefficiency (Coelli, 1996). The DEA model proposed by Charnes et al. (1978) which assumes input-orientation and constant returns to scale has been employed in several studies (e.g. see, Cummins & Nini, 2002; Worthington & Hurley, 2002). However, Eling and Luhn (2010b) in the survey of about 55 studies which employ the DEA, contend that the DEA specification under the assumption of variable returns to scale (VRS) which was proposed by Banker et al. (1984) is the most widely used specification.

The VRS model is the most preferred model for the DEA estimation of efficiency because compared to the CRS model, which assumes that all the sample firms considered (also referred to as decision making units (DMUs)) are operating at an optimal scale, the VRS accounts for market imperfections such as constraints on finance, imperfect competition, and so on, which might hinder firms from operating optimally (Coelli, 1996). The VRS specification model thus allows a more accurate estimation of the technical efficiency (TE) of firms which are not operating at optimal scale due to

market imperfections. In the VRS model, the frontier is formed as a convex hull of intersecting planes which provides a tighter envelope of the data points (compared with the conical hull of the CRS model), and results in efficiency scores which are greater than or equal to those obtained using the CRS model specification (Coelli & Perelman, 1999).

Following the example given in Coelli (1996), the present study employs three inputs and two outputs (see section 5.4) in the estimation of technical and cost efficiency scores for the combined sample of Nigerian and South African micro-life insurers. Furthermore, the study uses the input-orientated measure of efficiency under the VRS assumption because the sample of micro-life insurers used in the present study are subject to various market imperfections (e.g., regulatory constraints, imperfect competition etc.) which have an impact on their operations. DEA measures the technical efficiency as the ratio of outputs to assigned inputs. The efficiency, e of an insurer i is thus measured by the ratio:

$$e_i = \frac{u'y_i}{v'x_i} \quad [5.1]$$

where u' represents the $M \times 1$ vector of output weights; v' is a $K \times 1$ vector of input weights of outputs; y_i is the vector of outputs for the i^{th} insurer; x_i is the vector of inputs for the i^{th} insurer – where, $i = 1, 2, \dots, 62$. The linear programming problem is then specified as shown below for each insurer, i to obtain optimal input and output weights for the maximisation of efficiency:

$$\begin{aligned} & \max_{u,v} \frac{u'y_i}{v'x_i} \\ \text{st } & \frac{u'y_j}{v'x_j} \leq 1 \quad \text{where } j=1,2,\dots,62. \\ & u, v \geq 0 \end{aligned} \quad [5.2]$$

The optimisation equation involves obtaining the values for u and v such that the efficiency measure is less than or equal to one, and the value for the i^{th}

firm is maximised. A downside to the optimisation equation is that it has an infinite number of solutions thus a constraint is imposed where the vector of input and output weights is transformed:

$$\begin{aligned}
 & \max_{\mu, v} (\mu' y_j) \\
 & \text{st } v' x_i = 1, \\
 & \mu' y_j - v' x_i \leq 0 \text{ where } j=1, 2, \dots, 62. \\
 & \mu, v \geq 0
 \end{aligned}
 \tag{5.3}$$

The envelopment form of equation [5.3] is therefore derived as:

$$\begin{aligned}
 & \min_{\theta, \lambda} \theta, \\
 & \text{st } -y_i + Y\lambda \geq 0, \\
 & \quad \theta x_i - X\lambda \geq 0, \\
 & \quad N1'\lambda = 1 \\
 & \quad \lambda \geq 0
 \end{aligned}
 \tag{5.4}$$

where θ is a scalar, λ is a $M \times 1$ vector of constants, and $N1$ is an $N \times 1$ vector of ones. The envelopment form of equation [5.4] involves fewer constraints. The linear programming is solved N times, and once for each i^{th} insurer. The value of θ is the technical efficiency, which satisfies the condition, $\theta \leq 1$, is obtained for each insurer with the value of 1 indicating a technically efficient firm with a point on the frontier. The behavioural objectives of insurers such as cost minimisation or revenue maximisation can be considered when information on price is available (Coelli, 1996). Following from equation [5.4], the information on input prices is employed in the estimation of the cost minimisation. Thus:

$$\begin{aligned}
 & \min_{\lambda, x_i} w_i' x_i^*, \\
 & \text{st } -y_i + Y\lambda \geq 0, \\
 & \quad x_i - X\lambda \geq 0, \\
 & \quad N1'\lambda = 1 \\
 & \quad \lambda \geq 0
 \end{aligned}
 \tag{5.5}$$

where w_i is a vector of inputs for the i^{th} -insurer and x_i^* represents the cost-minimising vector for the input quantities for the i^{th} -insurer (DMU), given the input prices w_i and the output levels y_i where $i=1,2, \dots, 62$. The total economic (cost) efficiency (CE)²⁰ of the i^{th} insurer is therefore computed as the ratio of the minimum cost to the observed cost as in [5.6] below:

$$CE_i = \frac{w_i'x_i^*}{w_i'x_i} \quad [5.6]$$

5.3.2 Econometric (SFA) Approach

SFA which was initially developed by Aigner, Lovell, and Schmidt (1977) and Meeusen and Van Den Broeck (1977), is the most commonly used econometric approach in frontier efficiency estimation. SFA specifies a functional form for the production, cost and profit relationship among inputs and outputs. SFA differs from DEA because it utilizes information on the total expenditure on the inputs used in addition to the information on input prices, output quantities, and also accounts for random error in the estimation of cost efficiency (Kumbhakar & Lovell, 2000). The two main decisions faced in the application of the econometric frontier approach – SFA, is the determination of the most appropriate functional form for the cost function and the distributional assumption for the error term. SFA methodology is usually applied in two steps. First, the cost function is estimated to determine the efficient frontier, while the deviation of individual firms from the efficient frontier due to inefficiency, and random error are estimated in the second stage. The cost frontier is defined as the function that gives the minimum attainable cost for each level of output (Eling & Luhn, 2010a). The stochastic cost frontier can be written as:

$$E_i \geq c(y_i, w_i; \beta) \cdot \exp\{\varepsilon_i\} \quad [5.7]$$

²⁰Following Biener and Eling (2011), the efficiency values are estimated separately for all years and based on a 'one-world' frontier.

where E_i is the expenditure incurred by the i^{th} insurer; y_i is the M X 1 vector of outputs of the i^{th} insurer; w_i is the N x 1 vector of input prices faced by the i^{th} insurer; β is the vector of technology parameters; ε_i is an insurer-specific error; and $[c(y_i, w_i; \beta) \cdot \exp\{\varepsilon_i\}]$ represents the stochastic cost frontier. The insurer-specific error ε_i is further decomposed into:

$$\varepsilon_i = v_i + u_i \quad [5.8]$$

where v_i is the two-sided random error component, and u_i is the non-negative cost inefficiency component (Kumbhakar & Lovell, 2000).

Functional Form

Cummins and Weiss (2000) contend that a lack of knowledge on the exact functional form of the production (cost) function of financial services firms has led to the use of various approximations. Therefore, the selection of the most appropriate functional form for the cost function frontier is one the major decisions in the econometric frontier estimation of efficiency. Some examples of the functional forms employed in various studies include the Cobb-Douglas, translog, generalised translog, composite-cost, and the Fourier flexible functional form.

- The *Cobb-Douglas* functional form is the most simple and earliest method used in the determination of the production function of firms (e.g. see, Schmidt & Lovell, 1979). Kumbhakar and Lovell (2000) contend that the simplicity of the Cobb-Douglas function enables direct focus on the error term which contains the information on cost efficiency. However, it has the disadvantage of not being able to accommodate multiple outputs without violating the requisite curvature properties in output space. Kumbhakar and Lovell (2000) further contend that if the true structure of (single-output) production technology is more complex than its Cobb Douglas representation, the un-modelled complexity could influence the error term, thus leading to biased inefficiency estimates.

- The *translog* production function developed by Christensen, Jorgenson, and Lau (1973) is the most widely used parametric function in literature (e.g. see, Cummins & Weiss, 2000; Cummins & Zi, 1998; Rai, 1996). The translog frontier has the advantage over earlier functional forms because it accommodates multiple outputs without violating the conditions of output curvature. Kumbhakar and Lovell (2000) contend that the translog frontier, which is more flexible than the Cobb-Douglas function, forms the basis of the empirical estimation and decomposition of cost efficiency based on the system of equations. Despite its prevalence in econometric efficiency estimation, the quadratic feature of the translog requires the independent variables to be greater than zero. In situations where multiple outputs are considered, and not all firms produce all outputs, the estimation of the translog function could become problematic (Cummins & Weiss, 2000). Several approaches, such as the setting of firms with zero outputs to a small positive number, have been employed to curb the limitations of the translog function.
- The *generalised translog*, *composite-cost*, and *Fourier flexible* functional forms are techniques which have been developed to address the limitations of the translog functional form. In the generalised translog function, the output variables are transformed using a Box-Cox transformation (e.g. see, Caves, Christensen, & Tretheway, 1980). The composite-cost function employed by Berger, Cummins, and Weiss (1997) in the analysis of economies of scope in the US non-life insurance industry, consists of a quadratic components for outputs which are linked through interaction terms to a log-quadratic component for input prices. The resulting functional form can then be estimated linear or log-linear. The generalised translog, composite-cost as well as the translog cost functions have been criticised in literature because they impose a U-shaped structure on the cost function (Cummins & Weiss, 2000). The Fourier flexible functional form developed by Gallant (1982) has been shown to address the limitation of the translog functions through the addition of

trigonometric (Fourier) transformations to the translog functional forms. This results in an extremely flexible function that does not impose a U-shape structure for the cost function (e.g. see, Berger et al., 1997; Fenn et al., 2008).

Distributional Assumptions for the Error term

SFA postulates a composed error model which is made up of two components: the random departures from efficiency, and the departures due to inefficiency. The random error component (v) is modelled using a two-sided random error term; because it differs across firms, it is assumed to be independent, identically distributed, and beyond the control of individual firms. On the other hand, the inefficiency component (u) is a one-sided error term which follows an asymmetric distribution because it can only act to increase (and not reduce) costs (see equation [5.8]). The distributional assumption for the random error component (v) is usually a symmetric distribution such as the standard normal (Eling & Luhn, 2010a). For the inefficiency component (u), distributions such as the half-normal, truncated-normal, exponential, and gamma could be employed. Greene (1990) in the estimation of the stochastic cost frontier of a cross section of US electricity utilities, obtained relatively similar values for the inefficiency component using all four (i.e., half-normal, truncated-normal, exponential, and gamma) distributional assumptions. However, he contends that the half-normal distributional assumption for the inefficiency component is relatively inflexible as it presumes that most firms are clustered near full efficiency, and thus proposes the use of other distributions such as the exponential distribution. On the other hand, Ritter and Simar (1997) argue that the choice of the distribution for the inefficiency component is largely immaterial, and suggests the use of relatively simple distributions such as the half-normal or exponential rather than more flexible distributions such as truncated-normal or gamma as suggested by Greene (1990).

Therefore, following prior literature (e.g., Eling & Luhn, 2010a), the present study employs the translog functional form in the specification of the

cost function. In addition, the translog function is the preferred functional form because the study employs two outputs, the dollar value of premiums and investment income, which is produced by all the micro-life insurers considered (see section 5.4). Thus, the specified cost function is not particularly affected by the quadratic feature limitations of the translog. The study also assumes the normal distribution for the random error component (v), and the exponential distribution for the inefficiency component (u). The translog cost function is specified as follows:

$$\ln C_{it} = \beta_0 + \sum_m \alpha_m \ln y_{mit} + \sum_n \beta_n \ln w_{nit} + \frac{1}{2} \sum_m \sum_j \alpha_m \alpha_j \ln y_{mit} \ln y_{jit} + \frac{1}{2} \sum_n \sum_k \beta_n \beta_k \ln w_{nit} \ln w_{kit} + \sum_n \sum_m \gamma_{nm} \ln w_{nit} \ln y_{mit} + v_{it} + u_{it}. \quad [5.9]$$

where i denotes the i^{th} insurer ($i= 1, 2, \dots, 62$), subscript t indexes the t^{th} - time period ($t= 2005, \dots, 2010$), C_{it} is the observed total cost²¹ for the i^{th} insurer in year t , y_{mit} is the amount of output m produced by the i^{th} insurer in year t , w_{nit} is the price of input n for the i^{th} insurer in year t , v_{it} is the random error term, and u_{it} is the inefficiency error term. In the estimation of the cost function, the symmetry restriction is imposed, and the total costs and input prices are divided by one of the input prices to ensure the linear homogeneity of degree 1 in input prices (e.g., see Kumbhakar & Lovell, 2000).

5.3.3 Input, Input Prices and Outputs

The definition of the most appropriate measure of inputs, outputs, and their respective prices is crucial in frontier efficiency estimation. The nature of the services (micro-insurance) sector which is characterised by intangible outputs, implicit prices, and lack of publicly available data on some inputs, makes the appropriate measurements of inputs and outputs problematic (Cummins & Weiss, 2000). However, prior insurance industry research (e.g. see, Eling & Luhn, 2010b) identified acceptable measures of

²¹As in prior studies (e.g., Choi & Weiss, 2005; Eling & Luhn, 2010a) observed total cost is measured as the operating expenses plus the cost of capital (see Appendix A).

inputs, outputs, and prices that produce economically meaningful efficiency scores.

Input and Input Prices

The three main insurance inputs as defined in literature are: labour, business services and materials, and capital²². Following prior literature on international insurance industry efficiency studies (e.g. see, Eling & Luhnen, 2010B; Fenn et al., 2008), the present study merges the labour, business services and materials into a single variable. Furthermore, due to the lack of publicly available data on the number of employees or hours worked in the (micro) insurance industry, the input quantities on labour and business services are proxied by dividing the expenditures for these inputs with publicly available price indices on wage rates. For example, the present study utilises operating expenses (including commissions) divided by the price of labour as the proxy for the labour and business services input quantities. The price of labour is defined as the regional International Labour Organization (ILO) average annual market wage rate. Debt and equity capital are considered as the most important inputs for which cost measures have to be found. Thus, debt capital is proxied as the total liabilities while the price of debt capital is measured as the country-specific annual long-term government bond rates. Equity capital which is proxied as the capital plus surplus is measured as the 5-year average of yearly total return rates of the relevant MSCI emerging markets indices (e.g., see Biener & Eling, 2011). The regional wage per year for the insurance sector per country is available from the ILO statistics while the proxies for the price of capital were obtained from the Thomson DataStream database.

²²Labour can be sometimes split further into agent labour and home office labour, because the two types of labour have different prices and are used in different proportions by firms in the industry. Business services and materials include travel, advertising etc., but are not usually subdivided. The three categories of capital that could be considered are: physical, debt and equity capital. Due to their small proportion, physical capital is usually merged into the business and materials category (Cummins & Weiss, 2000).

Outputs

The three principal approaches employed in the measurement of insurance outputs are: the value-added approach, the intermediation approach, and the user-cost approach²³. The value added approach has been described as the most appropriate method for efficiency studies, because it considers all the asset and liability categories, and counts them as important outputs if they contribute a significant added value based on operating and cost allocations (Berger, Cummins, Weiss, & Zi, 2000; Grace & Timme, 1992). The value added approach assumes that risk-pooling/risk-bearing, provision of real financial relating to insured losses and financial intermediation are the three main services provided by insurers, and thus output proxies are defined for each of these services. Eling and Luhn (2010b) contend that insurers create value-added by operating a risk pool, collecting premiums from policyholders, and redistributing them to customers who have incurred losses. They further contend that the provision of real services (e.g. financial planning) could create added value for policyholders. Cummins and Nini (2002) also contend that insurers create value added through financial intermediation by investing the premiums provided by policyholders, and paying out claims and other administrative expenses. For the risk-pooling/risk-bearing service in life insurance, either the premiums or incurred benefits have been used as proxies. However, what constitutes the most appropriate proxy for the risk pooling/risk bearing output has been the subject of debate in the literature (see Eling & Luhn, 2010b; Yuengert, 1993). Following prior research (e.g. see, Gardner & Grace, 1993; Greene & Segal, 2004), the present study employs the US dollar value of premiums as the proxy for the risk-pooling/risk-bearing functions because the output of a life insurer can be viewed the outcome of the selling effort and additional risk that the insurer bears. The intermediation function is proxied using the US dollar value of the investment income because insurers issue debt contracts (i.e., insurance policies or annuities), and invest the funds received until they

²³In the intermediation approach insurers are viewed as pure financial intermediaries who borrow funds from policy holders, invest the borrowed funds, and pay-out claims, taxes and costs (e.g. see, Brockett, Cooper, Golden, Rousseau, & Wang, 1998). The user-cost approach uses the net contribution of the financial product to total revenues in the determination of inputs or outputs (Hancock, 1985).

are used to pay claims and/or withdrawn by policyholders (Eling & Luhn, 2010a).

The use of frontier efficiency estimation techniques in the insurance sector, particularly in the academic literature, has seen rapid growth in recent years (Eling & Luhn, 2010a). However, the selection of the most appropriate frontier efficiency estimation approach has been subject to intense debate in literature with some researchers arguing for the econometric approach, and others for the linear programming approach. Indeed, both the econometric and linear programming approaches have their advantages and disadvantages, and there is no consensus as to which method is more superior (Cummins & Zi, 1998). In the present study, the cost efficiency estimates are derived using both the linear programming (DEA) and econometric (SFA) approaches in a first-stage analysis. The definition and measurement, and summary statistics of the input, input prices, and outputs are further depicted in Appendix B.

5.4 Panel Data Design

In the second-stage regression, a panel dataset is constructed from annual data covering the period 2005 to 2010 in order to test the research hypotheses developed in chapter 4. A panel data design has been shown to provide an effective estimation approach as it permits flexibility in modelling differences in behaviour across firms. Prior studies (e.g., see Baltagi, 2005; Hsiao, 1985, 2003) have emphasised the benefits of panel datasets for econometric research. Some of these advantages include:

- *Controls for individual heterogeneity*: Panel data has the advantage of controlling for the omission of country, firm and/or time invariant variables. For example, in the present study, the profitability of micro-life insurers from two countries-Nigeria and South Africa are modelled as a function of some independent variables (i.e., cost efficiency, ownership structure, leverage, and reinsurance) and control variables (i.e., regulation, firm size, age, product-mix, and interest rates). However, there could be other omitted country, firm and/or

time-invariant variables which could affect the profitability of micro-life insurers. Differences in financial literacy between Nigeria and South Africa could be an example of a country-specific variable that could affect the demand and supply, and subsequent profitability, of micro-life insurers. Furthermore, time-invariant variables such as geographical location could also affect the profitability of micro-life insurers. The omission of country, firm and time-specific variables could lead to biased parameter estimates.

- *Reduces collinearity among variables:* Some explanatory variables could be highly related with each other. For example, in the present study, the *Leverage* variable could be related to the *Reinsurance* variable (see section 3.6.5). This relation could be a potential source of multicollinearity, and result in the production of biased parameter estimates if time-series data are employed. However, the problem of multicollinearity is less likely in panel data because the cross-sectional dimension of the panel data design adds variability (i.e., between and within-firm variability) which leads to narrower confidence intervals despite the possible existence of multicollinearity (Baltagi, 2005).
- *Facilitates the analysis of dynamic adjustments:* Compared to cross-sectional data which examine the behaviour of firms at a certain point in time, panel data has the advantage of allowing the study of the variation in the behaviour of firms across different time periods. For example, the panel data design allows the examination of the variation in the profitability of micro-life insurers in different time periods.

Despite its advantages, there are certain limitations that could arise in the use of panel data design. The main limitation of the panel data design in the current study is the issue of potential sample bias arising from an unbalanced panel. For example, the consolidation exercise conducted in the Nigerian insurance industry in 2007 triggered a spate of mergers and acquisitions in which some firms were closed to new business and became run-offs, while new firms were also being established. These changes result in incomplete or unbalanced panels, as the sample-data may not reflect all of

the population of micro-life insurance firms, thus resulting in the production of biased outcomes. However, on balance the advantages of the panel data design are considered to outweigh this potential limitation.

5.5 Model Specification

The modelling procedure employed in the second-stage regression analysis follows prior literature on the determinants of financial performance. The definitions of all variables included in the analysis are presented in Appendix B. To conduct the panel data analysis, the general base-line regression equation is estimated as follows:

$$Profit_{it} = \alpha + \beta_1 Efficiency_{it} + \beta_2 Ownership_{it} + \beta_3 Leverage_{it} + \beta_4 Reinsurance_{it} + \beta_6 \{Controls\}_{it} + u_{it} \quad [5.10]$$

where, i indexes the i^{th} insurer ($i = 1, 2, \dots, 62$), subscript t indexes the t^{th} -year (i.e., time periods, $t = 2005, \dots, 2010$). $Profit_{it}$ is the dependent variable - annual profitability; $Efficiency_{it}$ is the cost efficiency estimate; $Ownership_{it}$ is the ownership structure dummy variables; $Leverage_{it}$ represents the level of leverage; $Reinsurance_{it}$ is the level of reinsurance purchased; $\{Controls\}_{it}$ represents the country and firm-specific variables; $\beta_1 - \beta_4$ are $K \times 1$ vectors of the independent variables; and β_6 is $L \times 1$ vectors with L representing the number of control variables. The disturbance term is specified as a two-way error component model in the form:

$$u_{it} = \mu_i + \lambda_t + v_{it} \quad \text{where } i = 1, 2, \dots, 62; t = 2005, \dots, 2010 \quad [5.11]$$

where μ_i indicates insurer-specific effects, λ_t indicates year-specific effects and v_{it} indicates the remainder (random) disturbance. The explanations of each of the variables in equation [5.10] are given below.

5.5.1 Dependent Variable

Following prior studies (e.g., see Greene & Segal, 2004; Wipf & Garand, 2010), the dependent variable, $Profit_{it}$, is the annual profitability- the return on assets (ROA) - which is measured as the ratio of net income before interest and taxes for insurer i in year t to the average of total assets in years t and $t - 1$ ²⁴. More specifically, this variable is defined as:

$$\frac{NI}{TA} = \frac{EP_t + I_t - CL_t - \{+Co_t\}}{\frac{TA_t + TA_{t-1}}{2}} \quad [5.12]$$

where t denotes the t^{th} year, NI represents net income; EP_t represents premiums earned (net of reinsurance); I_t is investment income (net of fees); CL_t is incurred claims (net of reinsurance recoverable), ME_t is management expenses, Co_t is commissions paid, and TA is total assets.

5.5.2 Independent Variables

The independent variables used in the study are explained below.

Cost Efficiency (Efficiency): As in Greene and Segal (2004), cost efficiency estimates derived from the DEA (see equation [5.5]) and SFA (see equation [5.7]) analyses. Because micro-insurance is by design a low-premium product, the proportion of the premium that must go to pay for expenses (as opposed to payment for covered losses) i.e., the transaction costs are high. Therefore, as in Choi and Weiss (2005) cost efficient firms are expected to be more profitable than cost inefficient firms.

Ownership structure (Ownership): Consistent with He and Sommer (2010), the ownership structure is represented by dummy variables for each share ownership class considered, namely: $D_p = 1$ for public (widely-held) stock micro-life insurer, and 0 for private (closely-held) stock micro-life

²⁴ Prior studies (e.g. see, Carroll, 1993; Pope & Ma, 2008) have also used the ratio of net income to net premiums earned in the estimation of annual profitability.

insurer. For the variation of private (closely-held) stock micro-life insurers; $D_{pm} = 1$ for shareholdings closely-held by management, 0 otherwise; $D_{pb} = 1$ for shareholdings closely-held by banks, and 0 otherwise; while $D_{po} = 1$ for shareholdings closely-held by others (e.g., insurance companies, financial companies, and mutual funds), and =0 otherwise.

Leverage (*Leverage*): The degree of financial leverage reflects the ability of the micro-life insurer to manage their economic exposure to unexpected losses. Following, Rajan and Zingales (1995), leverage is estimated as the ratio of life insurance liabilities plus other liabilities (net of reinsurance) to surplus (net admissible assets). An insurance company's surplus is the amount by which total assets exceed total liabilities. The greater an insurer's leverage, the higher the ratio. As discussed in chapter 4, section 4.4, high *Leverage* could have a positive (tax-shield benefits) or negative (agency costs) impact of the profitability of a firm.

Reinsurance (*Reinsurance*): Following prior research (e.g., Adiel, 1996) on the corporate demand for reinsurance. The level of reinsurance of reinsurance is measured as:

$$Reinsurance_t = \frac{Ceded\ premium\ written_t}{Gross\ premium\ written_t} \quad [5.13]$$

The measure reflects the total amount of reinsurance purchased by a micro-life insurance firm. As discussed in chapter 4, the level of reinsurance (*Reinsurance*) could have a positive (Garven & Lamm-Tennant, 2003) or negative (Jean-Baptiste & Santomero, 2000) impact on the profitability of micro-life insurers.

5.5.3 Control Variables

In addition to the explanatory variables stated above, five control variables which could also affect the profitability of micro-life insurers are included in

the regression model. The motivation for including the control variables is as follows:

Regulation: The development of any market could be either enhanced or stifled by regulation. Prior research (e.g., see Biener & Eling, 2012; Kwon, 2010) contend that the regulatory and legal frameworks in developing economies could play a significant role in the penetration and profitability of micro-insurance programs. Indeed, Outreville (1990) contends that a well-established and clear regulatory framework could ease the barriers to market entry, encourage product-market innovations, and foster increased competition between micro-insurance suppliers, thereby empowering low income groups with risk management solutions and improved access to financial services. For example, the Insurance Regulation and Development Authority (IRDA) Act (2000) in India which made it compulsory for insurance companies to allocate 5% of their gross premium income for provision of insurance in the rural and social sectors has been partly responsible for the rapid increase in micro-insurance schemes and opened up realistic opportunities for the poor to purchase insurance (Ito & Kono, 2010). On the other hand, stringent and/or inadequate regulation could also hinder the development of micro-insurance. For example, Ayorinde (2001) argues that in Nigeria, inadequate regulatory controls such as the Insurance Act (1976) which makes it mandatory for all insurance companies to invest their funds in domestic assets has been largely responsible for the generally low levels of insurance penetration and lacklustre profitability of local insurance companies. Furthermore, tight regulatory schemes (e.g., Asfaw & Jütting, 2007) and regulation-induced transaction costs (e.g., Pauly, Zweifel, Scheffler, Preker, & Bassett, 2006) have also been reported for micro-health schemes. Therefore, the adequacy or otherwise of insurance regulation is likely to be an important consideration in the management of information asymmetries, agency problems, and other market imperfections with micro-insurance schemes in Africa. Biener, Eling, and Schmit (2013) in their study of the impact of regulation on micro-insurance markets propose that regulations which yield arbitrage between micro-insurance and standard (or “conventional”) insurance regulatory systems should be avoided. Koven and Zimmerman (2011) describe the ideal regulatory environment for micro-

insurance as one which neither over-promotes the market nor creates barriers by insisting on rigid enforcement of traditional insurance guidelines. As noted previously (see chapter 2, section 2.2), there is currently no specific micro-insurance regulation in Nigeria and South Africa. Thus, the regulatory quality index of the Worldwide Governance Indicators which captures the perceptions of the ability of the government to formulate and implement sound policies and regulations that promote private sector development is used as a proxy to measure regulation. More specifically, the annual percentile rank for each country on regulatory quality is used in the present study. The percentile rank indicates the percentage of countries that rank lower than the indicated country such that higher values indicate better regulatory quality (World Bank, 2012b).

Size: Hardwick (1997) contends that large insurers are more able to efficiently diversify assumed risks and so reduce the unit cost of risk in the management of their underwriting portfolios. Adams and Buckle (2003) also suggest that large insurers are likely to have better financial performance than small insurers because they can realize scale economies through increasing output and economizing on the unit costs of technology and product development. Large insurers can also more efficiently diversify assumed risks and so reduce the unit cost of risk in the management of their underwriting portfolios. However, and Eling (2011) find that large micro-insurers were inefficient, and had the highest potential for upgrading the use of technology in their operations. Furthermore, Adams and Buckle (2003) point out that the profitability of large insurers could be adversely affected by the enhanced information asymmetries and agency costs that often arise when organizations get bigger. Therefore, the predicted effect of firm size on the profitability of micro-life insurers is not clear from the literature. Firm size (*Size*) is measured as the natural logarithm of total assets.

Product Mix: Abdul Kader et al. (2010) report that the operational efficiency, and hence profitability, of insurance firms could be affected by their product-mix as multi-product insurers are likely to benefit not only from economies of scale but also from economies of scope in the use of shared

inputs (e.g., labour, technology, and so on). Mathewson (1983) also acknowledges that in multi-product insurance firms managers can spread assumed risks across different lines of insurance by imposing different underwriting criteria in order to realize economic gains in particular market segments while concomitantly keeping overall underwriting risk within acceptable bounds. Therefore, we expect that, all else equal, multi-line micro-life insurers will be more profitable than micro-life insurers with a narrow product-range. As in Mayers and Smith (1990), *Product Mix* is measured by a Herfindahl concentration index that is computed using the 3 major lines of products sold by micro-life insurers in Nigeria and South Africa²⁵. The Herfindahl index for each firm is computed as:

$$Product\ Mix = \sum_{l=1}^3 \left(\frac{Dpw_l}{Tpw} \right)^2 \quad [5.14]$$

where Dpw_l is the amount of direct premium written in the l^{th} line of insurance, and Tpw is the amount of total premiums written across the micro-life insurance lines. The closer the Herfindahl index to one, the more concentrated is the production function of the micro-life insurer.

Age: The length of time an insurance provider has been operating in the micro-life segment of the market could influence period profits. For example, established operatives are expected to have better local knowledge and a more dedicated sales force than new entrants to the market. Therefore, the length of time in the local micro-life insurance market is expected to be positively related to profitability. However, Biener and Eling (2011) found that firms which have been active in the micro-insurance market for long periods tended to be less efficient than new entrants to the micro-insurance market. *Age* is measured as the number of years an insurer has been operating in the micro-life insurance market. In addition, following Hsu and Petchsakulwong (2010) the natural logarithm of *Age* (i.e., $\ln Age$) is

²⁵ The three main micro-life insurance business lines are term-life insurance, credit life and funeral insurance.

employed in the regression analysis to control for extreme values in the length of time of operations of the sample of micro-life insurers investigated.

Interest rates : Doherty and Garven (1995) suggest that profit margins reflect the average price of traded insurance policies and that in competitive markets insurance prices follow, and are inversely related to, the movement of average annual interest rates in the economy (which in Nigeria and South Africa are roughly 8% and 6% per annum respectively). This reasoning implies an inverse relation between profitability and interest rates. On the other hand, high interest rates can improve yields on investments' such as cash deposits and bonds. This suggests that there will be a positive linkage between the profitability of micro-insurance schemes and the level of interest rates in the economy (Olaosebikan, 2013). Therefore, the predicted effect of interest rates on the level of profitability of micro-life insurers is ambiguous. The variable *Interest rate* is measured as the annual commercial bank interest rate which is obtained from the international financial statistics database (International Monetary Fund, 2012).

Time Effects: Dummy variables for each year are also employed in the model to proxy for other macroeconomic factors such as changes in underwriting prices and inflation, which are cross-sectionally constant.

Country Effects: To control for country-specific effects (e.g. cultural factors), a dummy variable for *Country* is included in the model; where 1 represents Nigerian micro-life insurers, and 0 represents South African micro-life insurers.

Interaction term (Reinsurance x Leverage): As noted earlier (see chapter 3, section 3.6.5), prior research (e.g., Adams et al., 2008; Garven & MacMinn, 1993) contend that insurers with high leverage tend purchase more reinsurance to alleviate the costs of bankruptcy. Therefore, an interaction

term, *Reinsurance x Leverage*²⁶, is included in the model to capture the interaction between these two variables.

The definition and measurement of the dependent, independent, and control variables are also given in Appendix C.

5.6 Econometric Diagnostics

In order to determine the most appropriate panel data estimator for the model in equation [5.10], a series of diagnostic tests are conducted. First, the Breusch-Pagan Lagrangean Multiplier Test (1980) is applied to examine the relative efficiency of the heterogeneous panel (fixed/random effects) estimation against the homogenous pooled OLS model. The Wald F-statistic and the LM chi-square are both statistically significant and the null hypothesis of no firm or period specific effects in the sample data is rejected (p -value < 0.01). Thus, suggesting that the panel data which has the advantage of controlling for omitted firm- and/or period-specific effects is more appropriate for the analysis of the sample data. Second, the Hausman Specification Test (1978), which examines the differences between the coefficients obtained from fixed and random-effects panel data models, is conducted to determine the most appropriate panel model specification. The computed chi-square is found to be statistically insignificant (p -value > 0.10), indicating that the coefficient estimates obtained from the random-effects panel data model are more efficient.

Further diagnostic tests are conducted to test for the presence of serial and cross-sectional correlation (heteroskedasticity) which could lead to inconsistent estimates in panel data. The Wooldridge (2002) test is conducted to test for serial correlation in the idiosyncratic errors of the linear panel data model. The null hypothesis of no first order serial correlation in the panels is rejected (p -value < 0.01). The Modified Wald proposed by

²⁶ The introduction of interaction terms could lead to high levels of multicollinearity in the regression model, thus the 'centering' procedure is applied in which each variable is subtracted from their corresponding mean values before constructing the multiplicative interaction terms. The centering procedure reduces the correlation between the product terms and the component parts of the interactive effects (Coulton & Chow, 1993).

Greene (2003) is further applied to test for the presence of group-wise heteroskedasticity. The null hypothesis of no group-wise heteroskedasticity is rejected (p -value < 0.01). Therefore, following Grace and Leverty (2012) the FGLS estimation method which accounts for the presence of both the panel-specific heteroskedastic and serial correlated error terms is employed in the multivariate regression analysis. The FGLS estimator, proposed by Parks (1967) has been identified as the most appropriate methodology to improve upon the estimation efficiency when the panel data sample is faced with the problems of both serial correlation and heteroskedasticity. However, despite the efficiency gain of the FGLS in allowing for the heteroskedasticity and serial correlation, it is not without its drawbacks. For instance, Wooldridge (2002) contends that it is difficult to assess the performance of FGLS in finite samples due to the difficulty in deriving finite sample properties. In the present study, the FGLS estimator is specified to control for panel-specific heteroskedasticity because the data sample employed consist of micro-life insurance firms from two different countries. In addition, the panel-specific AR (1) serial correlation structure also is specified for the model due to the unbalanced nature of the panel data set.

5.7 Summary and Conclusion

This chapter describes the sources of data and the period of empirical analysis. The study uses data obtained from the annual financial statements of micro-life insurance firms in Nigeria and South Africa. The final sample consists of 310 firm-year observations over the period of 2005-2010. The chapter also describes the frontier efficiency methods (i.e., DEA and SFA) and variables employed in the first-stage analysis to derive the cost efficiency estimates. In addition, the definition and measurement of the dependent, independent and control variables which are used in the second-stage regression analysis to test the research hypothesis put forward in chapter 4 are also described. Finally, the chapter specifies and justifies the use of the FGLS model employed in the multivariate regression. The empirical results obtained from the statistical analysis are now reported and discussed in the next chapter of this thesis.

Chapter 6

Empirical Results

6.1 Introduction

The implications of managerial success in reducing market imperfections (e.g., information asymmetries and transaction costs) and building capacity to realize economies of scale as described in chapter 3 of this thesis, is crucial to the profitability of micro-life insurers. Consequently, the four main research hypotheses which were put forward in chapter 4 are now tested using the research design and other statistical procedures as described in chapter 5. Specifically, the univariate analyses in which summary statistics are used to describe the key aggregate features of the variables are employed. This is followed by a bivariate analysis in which the Pearson/Spearman correlation analyses are used to test the association between pairs of each variable. Finally, the FGLS analysis is employed to examine the determinants of profitability while controlling for country, firm-related, and time-specific effects.

6.2 Univariate Analysis-Descriptive Statistics

The cross-sectional and time-series data are first pooled and described using descriptive statistics including the mean, median, standard deviation, minimum and maximum range, and number of observations. The descriptive statistics summarises the overall characteristics of the dataset and ascertains the distribution for each variable.

Table 6.1 Panel A, reports the means, medians, standard deviations, and minimum and maximum values for the dependent, independent and control variables for the combined data-set of Nigerian and South African micro-life insurers used in the regression analysis. The descriptive statistics are

computed from the panel data sample of 310 firm-year observations. The results show that the annual profitability (*Profit*) of the total sample of South African and Nigerian micro-life insurers over the period (2005-2010) on average is 9 percent. The maximum profitability is reported at over 33 percent while the minimum profit is reported as a loss of around 8 percent.

Turning to the independent variables, Table 6.1 Panel A, reveals that the average cost efficiency of the total sample of firms derived using the DEA (*Efficiency-DEA*, mean=0.31), is lower than the estimates obtained using the SFA (*Efficiency-SFA*, mean=0.799). In addition, there is also a large variation in the values of the cost efficiency estimates derived using the DEA (*Efficiency-DEA*, Std. dev=0.295). These findings are as expected, and consistent with the results of prior literature (e.g., Cummins & Zi, 1998) which use multiple frontier efficiency methods. The cost efficiency estimates derived using the DEA are expected to be lower than the estimates derived using the SFA, because the DEA measures all the random departures from the frontier as inefficiency, while the SFA separates the departures from the frontier into the inefficiency and random error components. Appendix A, Panel B reports the results of the principal components of cost efficiency-technical and allocative efficiency. The results reveal that inefficient resource allocation makes a lower contribution to overall cost efficiency. The values for technical efficiency range from 0.08 to 1.00 with a mean of 0.65 for the combined data sample indicating that micro-life insurers in Nigeria and South Africa could improve their production efficiency on average by 35 percent possibly through upgrading their operations to state-of-the-art technology. Allocative efficiency with a mean of 0.48 is lower than technical efficiency suggesting that overall cost efficiency could be improved by focusing on cost-minimizing input combinations. For the *Ownership* dummy variables, D_{pr} , D_{pm} , D_{pb} , D_{po} , the results reveal that widely-held (public) stock micro-life insurers (D_p) account for about 32 percent of the total sample firms while closely-held (private) stock firms (i.e., D_{pm} , D_{pb} , D_{po}) account for 68 percent of sample firms. Table 6.1, Panel A further reveals that the degree of financial leverage is on average (*Leverage*, mean=2.48) considerably high suggesting that the total liabilities of the sample firms exceed the surplus. The standard deviation (*Leverage*, Std. dev=3.38) exceeds the mean value suggesting the

presence of extreme values in the tails of the sample distribution. The mean (median) of *Reinsurance* is 10 percent (6 percent), implying that on average, micro-life insurers in Nigeria and South Africa only cede a relatively small percentage of their annual gross premiums to third party reinsurer. The standard deviation of reinsurance (*Reinsurance*, Std. dev=0.13) exceeds the mean value suggesting a variation in the level of reinsurance of the sample firms, with some firms having no reinsurance arrangements at all during the period (2005-2010) of analysis.

For the control variables, Table 6.1 Panel A reveals the mean value of *Regulation* is roughly 47 percent, suggesting that about 47 percent of countries/firms worldwide rank lower than Nigeria and South Africa in terms of the regulatory quality (i.e., the perception of the ability of the government to formulate and implement sound policies and regulations that promote private sector development). Furthermore, the standard deviation for regulation (*Regulation*, Std. dev=0.22) is high, indicating significant variation in the regulatory environment of the total sample of firms considered. The average insurer size is 9.42, which represents an approximate value of USD\$ 13 million of total admitted assets. The smallest micro-life insurer in the sample has total assets valued at USD\$ 0.085 million (*Size*, Min. = 4.45) and the largest retains total assets of about USD\$40 billion (*Size*, Max. = 17.50)²⁷. Furthermore, the standard deviation of firm size variable (*Size*, Std. dev. = 3.03) indicates a considerable variation in the size of the sample firms. Just under 14 percent of sample observations have policies written in a single line of business (i.e., *Product Mix*=1) with an average of 0.69 for all firm-year observations in the sample. However the average (*Product Mix*, mean = 0.69) is larger than the median (*Product Mix*, median= 0.65), implying that the sample is slightly skewed towards less diversified micro-life insurers. The average length of time of operation in the micro-insurance market, *Age* for the sample firms is approximately 24 years. However, a large variation exists in the age of the sample firms (*Age*, Std. dev. = 20.78), with the oldest firm operating in the market for about 98 years.

²⁷Eling and Luhn (2010a) found an average size of USD\$2.8 billion in a study of the cost efficiency of insurers from 36 countries. Hence, compared to regular insurance markets, the micro-life insurers examined in the present study are relatively small in terms of total assets.

Table 6.1: Descriptive Statistics: Nigeria and South African Micro-Life Insurers, 2005-2010.

Panel A: Total Sample- Nigerian and South African Micro-life Insurers							
Variable	Mean	Median	Std. Dev	Min.	Max.	Observation	
<i>Profit</i>	0.092	0.068	0.122	-0.076	0.331	303	
<i>Efficiency-DEA</i>	0.314	0.207	0.295	0.002	1.000	303	
<i>Efficiency-SFA</i>	0.799	0.821	0.087	0.168	0.943	303	
<i>Ownership: D_p</i>	0.317	1.000	0.466	0.000	1.000	303	
<i>D_{pm}</i>	0.313	0.000	0.467	0.000	1.000	303	
<i>D_{pb}</i>	0.208	0.000	0.406	0.000	1.000	303	
<i>D_{po}</i>	0.155	0.000	0.363	0.000	1.000	303	
<i>Leverage</i>	2.480	1.039	3.377	-5.424	18.152	303	
<i>Reinsurance</i>	0.100	0.059	0.134	0.000	0.799	303	
<i>Regulation</i>	0.465	0.640	0.223	0.190	0.710	303	
<i>Size</i>	9.422	8.599	3.039	4.452	17.504	303	
<i>Product Mix</i>	0.686	0.648	0.216	0.214	1.000	284	
<i>Age</i>	24.990	18.000	20.777	1.000	98.000	303	
<i>InAge</i>	2.887	2.890	0.861	0.693	4.585	303	
<i>Interest</i>	0.077	0.076	0.021	0.038	0.108	303	
<i>Country</i>	0.465	0.000	0.500	0.000	1.000	303	
<i>Reinsurance x Leverage</i>	0.026	0.037	0.659	-1.711	5.031	303	
Panel B: Sample of Nigerian Micro-life Insurers							
Variable	Mean	Median	Std. Dev	Min.	Max.	Observation	
<i>Profit</i>	0.080	0.065	0.107	-0.076	0.331	141	
<i>Efficiency-DEA</i>	0.378	0.258	0.348	0.045	1.000	141	
<i>Efficiency-SFA</i>	0.815	0.826	0.054	0.541	0.908	141	
<i>Ownership: D_p</i>	0.497	1.000	0.501	0.000	1.000	141	
<i>D_{pm}</i>	0.156	0.000	0.364	0.000	1.000	141	
<i>D_{pb}</i>	0.277	0.000	0.449	0.000	1.000	141	
<i>D_{po}</i>	0.071	0.000	0.258	0.000	1.000	141	
<i>Leverage</i>	0.582	0.332	0.954	-2.370	7.431	141	
<i>Reinsurance</i>	0.103	0.046	0.142	0.000	0.799	141	
<i>Regulation</i>	0.228	0.240	0.027	0.190	0.260	141	
<i>Size</i>	7.590	7.808	1.540	4.452	10.849	141	
<i>Product Mix</i>	0.632	0.621	0.189	0.214	1.000	124	
<i>Age</i>	24.347	19.000	14.113	2.000	53.000	141	
<i>InAge</i>	3.001	2.944	0.663	0.693	3.970	141	
<i>Interest</i>	0.069	0.076	0.024	0.038	0.099	141	
<i>Reinsurance x Leverage</i>	0.019	0.126	0.326	-1.700	0.401	141	

Table 6.1: Descriptive Statistics: Nigeria and South African Micro-Life Insurers, 2005-2010 (Continued).

Panel C: Sample of South African Micro-life Insurers							
Variable	Mean	Median	Std. Dev	Min.	Max.	Observation	
<i>Profit</i>	0.102	0.078	0.134	-0.076	0.330	162	
<i>Efficiency-DEA</i>	0.258	0.179	0.246	0.145	1.000	162	
<i>Efficiency-SFA</i>	0.798	0.813	0.075	0.449	1.00	162	
<i>Ownership: D_p</i>	0.161	1.000	0.368	0.000	1.000	162	
<i>D_{pm}</i>	0.457	0.000	0.499	0.000	1.000	162	
<i>D_{pb}</i>	0.148	0.000	0.356	0.000	1.000	162	
<i>D_{po}</i>	0.228	0.000	0.421	0.000	1.000	162	
<i>Leverage</i>	4.132	2.875	3.834	-5.424	18.152	162	
<i>Reinsurance</i>	0.097	0.052	0.127	0.000	0.630	162	
<i>Regulation</i>	0.672	0.670	0.025	0.640	0.710	162	
<i>Size</i>	11.040	11.148	3.085	5.102	17.505	162	
<i>Product Mix</i>	0.725	0.703	0.225	0.287	1.000	160	
<i>Age</i>	25.549	16.000	24.216	1.000	98.000	162	
<i>lnAge</i>	2.789	2.770	0.974	0.693	4.585	162	
<i>Interest</i>	0.084	0.091	0.016	0.064	0.108	162	
<i>Reinsurance x Leverage</i>	0.033	0.015	0.850	-1.711	5.031	162	

Source: Research Data. This table reports the descriptive statistics for Nigerian and South African micro-life Insurers for the years 2005 to 2010. Panel A, shows the descriptive statistics for the combined dataset of Nigerian and South African micro-life insurers. Panel B, presents the descriptive statistics for the Nigerian micro-life insurer data-set while Panel C presents the descriptive statistics for the South African data-set. *Profit* is the annual profitability-the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t - 1$. *Efficiency-DEA* is the cost efficiency estimates derived using DEA in the first-stage analysis (see section 5.3.1). *Efficiency-SFA* is the cost efficiency estimates derived using SFA in the first-stage analysis (see section 5.3.2). *Ownership* represents the ownership structure variables; D_p , D_{pm} , D_{pb} , D_{po} where $D_p = 1$ for widely-held (public) stock micro-life insurers, and 0 for private (closely-held) stock micro-life insurer, $D_{pm} = 1$ for micro-life insurers with shareholding closely-held by managers, and 0 otherwise, $D_{pb} = 1$ for micro-life insurers with shareholdings closely-held by Banks, and 0 otherwise, $D_{po} = 1$ for micro-life insurers with shareholding closely-held by 'others' (such as insurance companies, financial companies, and mutual funds), and 0 otherwise. *Leverage* is the total liabilities-to- surplus ratio. *Reinsurance* is the ratio of gross premium written ceded to the reinsurer. *Regulation* denotes the regulatory environment which is proxied using the country-specific annual percentile rank of the regulatory quality index of the Worldwide Governance Indicators (WGI). The regulatory quality index captures the perceptions of the ability of the government to formulate and implement sound policies and regulations that promote private sector development. *Size* is the natural logarithm of total admitted assets. *Product Mix* is the line of business Herfindahl index, which measures the product diversification of the micro-life insurer. *Age* is the length of time of operations in the micro-insurance market. *lnAge* is the natural logarithm of the length of time of operations of a firm in the micro-insurance market. *Interest* is the country-specific annual commercial bank lending rate. *Country* is a country dummy variable where 1= Nigeria, and 0= South Africa.

The average annual commercial bank lending rate, *Interest* for the sample period is approximately 8 percent. The standard deviation (*Interest*, Std. dev=0.02), however, is small, indicating that the interest rates does not change significantly from year-to-year. Finally, the *Country* dummy variable indicates that Nigerian micro-life insurers' account for approximately 46 percent of the total sample of firms considered in the study.

Table 6.1 Panels B and C, report the means, medians, standard deviations, and minimum and maximum values for the dependent, independent and control variables for the dataset Nigerian and South African micro-life insurers respectively. The descriptive statistics are computed from the panel data sample of 141 firm-year observations for Nigerian micro-life insurers, and 162 firm-year observations for South African micro-life insurers. The values obtained for *Profit* indicate that on average, both Nigerian and South African micro-life insurers have comparable levels of annual profitability. The average annual profitability, *Profit* for Nigerian micro-life insurers is 8 percent while the average annual profitability (*Profit*) for South African micro-life insurers is approximately 10 percent.

Turning to the independent variables, Table 6.1, Panels B and C indicate that Nigerian micro-life insurers (*Efficiency-SFA*, mean=0.82; *Efficiency-DEA*, mean=0.38) are on average more cost efficient than South African micro-life insurers (*Efficiency-SFA*, mean=0.79; *Efficiency-DEA*, mean=0.26) when either the DEA or SFA is employed in the derivation of the cost efficiency estimates. Furthermore, the standard deviation of the cost efficiency estimates derived using the DEA (*Efficiency-DEA*, Nigeria, Std. dev =0.35; South Africa, Std. dev = 0.25) for both countries is high, indicating a large variation in the estimates obtained. For the ownership structure, *Ownership*, the results indicate that the data sample for Nigerian micro-life insurers' is approximately evenly split between widely-held (public) firms (i.e., *Ownership* D_p , mean=0.49) and closely-held (private) firms. Table 6.1, Panel C further reveals that the data sample for the South African micro-life insurers' consists of 16 percent widely-held (public) stock firms, D_p while the remaining 84 percent accounts for closely-held (private) stock firms. Interestingly, closely-held stock firms owned by managers, D_{pm} at 46

percent account for the highest percentage of the closely-held (private) micro-life insurers highlighting the entrepreneurial nature of owner-managers of South African firms. The average ratio of the total liabilities to surplus for South African micro-life insurers (*Leverage*, mean=4.13) is significantly higher than that for Nigerian micro-life insurers (*Leverage*, mean=0.58). However, there is significant variation in *Leverage* for South African firms (*Leverage*, Std. dev. =3.83), indicating the presence of some extreme values in the tails of distribution. The mean (median) of *Reinsurance* at, 10 percent (5 percent) and 8 percent (5 percent) for Nigerian and South African micro-life insurers respectively, is comparable for firms in both countries. This indicates that on average, both Nigerian and South African micro-life insurers only cede a small (> 10 percent) per proportion of their annual gross premiums to reinsurers. The results further suggest a limited micro-life reinsurance market for Nigeria and South Africa, especially for Nigeria which has legal restrictions on reinsurance with foreign reinsurance firms.

For the control variables, Table 6.1 Panel B and C indicate a significant difference in the average values of *Regulation* for Nigeria and South Africa (*Regulation*, Nigeria, mean. =0.23; South Africa, mean =0.67). On average, approximately 67 percent of countries worldwide rank lower than South Africa in terms of regulatory quality, while approximately 23 percent of countries worldwide rank lower than Nigeria in terms of regulatory quality. The higher values of the regulatory quality index obtained for South Africa suggests that South Africa has a better regulatory environment than Nigeria. The average *Size* for Nigerian micro-life insurers is 7.6, which represents an approximate value of USD\$ 2 million of total admitted assets, while the average *Size* for South African micro-life insurers is significantly higher at 11.04, which represents an estimated value of USD\$ 63 million of total assets. The total assets of the smallest micro-life insurer in Nigeria (*Size*, Min. = 4.45), is approximately USD\$ 0.085 million, while the smallest South African micro-life insurer (*Size*, Min. = 5.10) retains total assets valued at USD\$ 0.16 million. Furthermore, the mean values of *Size* for both countries are similar to the median values, implying that the distribution of the sample is not excessively skewed towards either large or small firms. On average,

the degree of product line concentration for Nigerian micro-life insurers is lower than that of South African micro-life insurers (*Product Mix*; Nigeria, mean=0.63, South Africa, mean=0.73). The mean value for *Product Mix* in both countries is higher than the median values (*Product Mix*; Nigeria, median=0.62, South Africa, mean=0.70), suggesting that the sample firms are slightly skewed towards less diversified micro-life insurers. Table 6.1, Panel B and C further show that the average length of time of operations (*Age*) of the Nigerian and South African micro-life insurers' in the data-set are similar (*Age*: Nigeria, mean=24.35; *Age*: South Africa, mean=25.55). There is also a significant variation in the age of the micro-life insurers in both countries (*Age*: Nigeria, Std. dev. =14.11, *Age*: South Africa, Std. dev. =24.22). However, South Africa has the oldest micro-life insurer which has been operating for 98 years. Furthermore, the average value for annual commercial bank lending rate, *Interest* for the sample period for Nigeria is approximately 7 percent while that of South Africa is estimated at 8.4 percent. The standard deviation (*Interest*, Nigeria, Std. dev. =0.02, South Africa, Std. dev. =0.02), however is small, indicating no significant year-to-year changes in annual interest rates for both Nigeria and South Africa.

6.3 Bivariate-Correlation Analysis

The bivariate analysis involves testing for the associations between the variables. The present study used both the Pearson and Spearman correlation coefficients²⁸. Chow (1982) contends that correlation analysis should be conducted prior to multivariate tests in order to minimise the risk of variable measurement errors, and identify inter-correlated variables which could distort the statistical significance of multivariate results. In addition, Belsley, Kuh, and Welsch (1980) contend that correlation analysis could reveal high and statistically significant collinearity between independent variables, following which other diagnostic tests such as the variance

²⁸ The Pearson correlation describes the linear association between two variables; however, the Pearson correlation coefficient could produce inaccurate results when associations between variables are non-linear. On the other hand, the Spearman correlation coefficient measures the consistency of the association between two variables independent of its form (Gravetter & Wallnau, 2011).

inflation factors (VIF) could be conducted to ascertain that the presence of multicollinearity would not affect the parameter estimates obtained in the multivariate analysis.

Table 6.2 gives the Pearson and Spearman correlation coefficients between all the dependent, independent and control variables for the pooled firm-year observations of Nigerian and South African micro-life insurers for the period 2005-2010. In line with previous studies (e.g., Choi & Weiss, 2005; Greene & Segal, 2004), and consistent with the first hypothesis (H1), a positive and statistically significant association is obtained between annual profitability (*Profit*) and the cost efficiency estimates derived using the DEA (*Efficiency-DEA*), as well as the estimates derived using the SFA (*Efficiency-SFA*) for both the Pearson and Spearman correlation. The Pearson correlation coefficient for *Efficiency-DEA* is positive and statistically significant ($p \leq 0.10$, two-tailed test), while *Efficiency-SFA* is also positive and statistically significant ($p \leq 0.01$, two-tailed test). The results suggest that the ability to control operational costs (cost efficiency) has a positive impact on the annual profitability of micro-life insurers, and that cost efficient firms are likely to have higher profitability than cost inefficient firms.

Turning now to the independent variables, consistent with Mayers and Smith (1994) and hypothesis H2a, a negative and statistically significant association ($p \leq 0.05$, two-tailed test) is obtained between the ownership structure dummy variable, D_p and *Profit*. This suggests that the increased agency costs due to the wider separation of ownership and control in widely-held (public) stock micro-life insurers result in a negative impact on the annual profitability. Furthermore, in the analysis of the variation of closely-held (private) stock micro-life insurers (i.e., D_{pm} , D_{pb} , D_{po}), a positive and statistically significant ($p \leq 0.05$, two-tailed test) association is found only between closely-held stock firms mainly owned by managers, D_{pm} and *Profit*. This implies that the closer merger of the owner-manager functions in firms closely-held by managers reduces the agency costs of monitoring and control, in line with hypothesis, H2c and consistent with the findings of He and Sommer (2010).

Table 6.2: Pearson and Spearman Correlation Matrix: Nigerian & South African Micro-life Insurers (2005-2010).

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
<i>Profit</i> (a)		0.139 ***	0.338 **	-0.124 **	0.105 *	-0.041	0.069	0.296 ***	-0.081	0.034	-0.018	-0.065	-0.079 *	-0.072	-0.055	-0.067
<i>Efficiency-DEA</i> (b)	0.087 *		0.514 ***	0.061	0.036	0.159 ***	-0.275 ***	-0.129 **	-0.310 ***	-0.213 ***	-0.159 ***	0.127 **	0.056	-0.019	0.236 ***	-0.006
<i>Efficiency-SFA</i> (c)	0.195 ***	0.369 ***		0.147 **	0.039	0.074	-0.293 ***	0.053	-0.269 ***	-0.124 **	-0.068	0.043	-0.031	-0.112 *	0.141 **	-0.061
<i>Ownership: D_p</i> (d)	-0.136 **	-0.035	0.162 ***		0.471 ***	-0.330 ***	-0.311 ***	-0.367 ***	-0.107 *	-0.313 ***	0.101 *	-0.136 **	0.435 ***	-0.181 ***	0.369 ***	0.190 ***
<i>D_{pm}</i> (e)	0.123 **	0.032	0.047	-0.452 ***		-0.328 ***	-0.309 ***	0.366 ***	-0.071	0.293 ***	-0.114 *	0.228 ***	-0.169 ***	0.113 *	-0.309 ***	-0.059
<i>D_{pb}</i> (f)	-0.055	0.213 ***	0.088	-0.338 ***	-0.341 ***		-0.217 ***	-0.85	0.054	-0.141 **	-0.122 **	-0.031	-0.091	0.021	0.167 ***	-0.024
<i>D_{po}</i> (g)	0.078	-0.217 ***	0.338 ***	-0.304 ***	-0.307 ***	-0.229 ***		0.085	0.159 ***	0.173 ***	0.135 **	-0.069	-0.235 ***	0.074	-0.243 ***	-0.138 **
<i>Leverage</i> (h)	0.204 ***	-0.046	0.082	-0.277 ***	0.322 ***	-0.069	0.018		0.004	0.616 ***	0.443 ***	0.121 **	-0.032	0.153 ***	-0.687 ***	-0.342 ***
<i>Reinsurance</i> (i)	-0.069	-0.164 ***	-0.448 ***	-0.108 *	0.001	-0.041	0.176 ***	0.061		0.065	-0.079	-0.221	-0.149 **	-0.066	-0.052	-0.387 ***
<i>Regulation</i> (j)	0.085	-0.234 ***	-0.165 ***	-0.359 ***	0.306 ***	-0.173 ***	0.244 ***	0.465 ***	0.079		0.526 ***	0.212 ***	-0.106 *	0.040	-0.866 ***	-0.261 ***
<i>Size</i> (k)	-0.071	-0.157 ***	-0.026	0.159 *	-0.103 *	-0.144 **	0.082	0.206 ***	-0.073	0.572 ***		0.048	0.375 ***	0.023	-0.569 ***	-0.202 ***
<i>Product Mix</i> (l)	-0.059	0.123 **	0.026	-0.143 **	0.235 ***	-0.045	0.056	0.101 *	-0.107 *	0.222 ***	0.043		-0.073	-0.075	-0.196 ***	-0.165 ***
<i>InAge</i> (m)	-0.093 *	-0.002	0.033	0.394 ***	-0.125 **	-0.081	-0.242 ***	-0.071	-0.177 ***	-0.126 **	0.411 ***	-0.110 *		-0.076	0.136 **	0.108 *
<i>Interest</i> (n)	-0.037	0.054	-0.119 **	-0.207 ***	0.147 ***	-0.006	0.085	0.141 **	0.022	0.294 ***	0.093	-0.026	-0.085		-0.229 ***	-0.031
<i>Country</i> (o)	-0.089	0.223 ***	0.168 ***	0.369 ***	-0.309 ***	0.167 ***	-0.243 ***	-0.467 ***	-0.079	-0.993 ***	-0.567 ***	-0.215 ***	0.125 **	-0.361 ***		0.294 ***
<i>Reinsurance x Leverage</i> (p)	-0.087	-0.084	0.082	-0.023	0.153 ***	-0.038	-0.119 **	0.505 ***	0.006	0.024	-0.081	-0.123 ***	-0.010	-0.016	-0.022	

Source: Research Data. This table presents the pairwise correlation for the years 2005-2010. The Pearson correlations are in the lower triangle (unitalised) and the Spearman correlations are in the upper triangle (italised). *Profit* is the annual profitability—the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t - 1$. *Efficiency-DEA* is the cost efficiency estimates derived using DEA in the first-stage of analysis (see section 5.3.1). *Efficiency-SFA* is the cost efficiency estimates derived using SFA in the first-stage of analysis (see section 5.3.2). *Ownership* represents the ownership structure variables; D_p , D_{pm} , D_{pb} , D_{po} where $D_p = 1$ for widely-held (public) stock micro-life insurers, and 0 for private (closely-held) stock micro-life insurer, $D_{pm} = 1$ for micro-life insurers with shareholding closely-held by managers, and 0 otherwise, $D_{pb} = 1$ for micro-life insurers with shareholding closely-held by banks, and 0 otherwise, $D_{po} = 1$ for micro-life insurers with shareholding closely-held by ‘others’ (such as insurance companies, financial companies, and mutual funds), and 0 otherwise. *Leverage* is the total liabilities-to-surplus ratio. *Reinsurance* is the ratio of gross premium written ceded to the reinsurer. *Regulation* denotes the regulatory environment which is proxied using the country-specific annual percentile rank of the regulatory quality index of the Worldwide Governance Indicators (WGI). The regulatory quality index captures the perceptions of the ability of the government to formulate and implement sound policies and regulations that promote private sector development. *Size* is the natural logarithm of total admitted assets. *Product Mix* is the line of business Herfindahl index, which measures the product diversification of the micro-life insurer. *InAge* is the natural logarithm of the length of time of operations of a firm in the micro-insurance market. *Interest* is the country-specific annual commercial bank lending rate. *Country* is a country dummy variable where 1= Nigeria, and 0= South Africa. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels (two-tail) respectively.

Table 6.2 further reveals a positive and statistically significant association ($p \leq 0.01$, two-tailed test) between *Leverage* and *Profit*. This result is consistent with hypothesis H3a, and indicates that the use of debt could be profit-enhancing for micro-life insurers. This result also lends support to the 'free cashflow hypothesis' of Jensen (1986), and the mitigation of overinvestment argument of Stulz (1990). On the other hand, a negative but statistically insignificant association is obtained between *Reinsurance* and *Profit*.

For the control variables, a negative and statistically significant ($p \leq 0.10$, two-tailed test) association is found between *Age* and *Profit*, suggesting that younger micro-life insurers are more profitable than more established operatives. This result is not surprising as Biener and Eling (2011) in the study of the performance of micro-life insurers' also found that firms which have been operating in the market for longer periods were least efficient, and had the highest potential of upgrading their operations to the state-of-the-art technology. Table 6.3 also gives the Pearson and Spearman correlation coefficients between all the independent and control variables. The statistically significant correlation between some of the explanatory variables also raises the possibility of multicollinearity. There is a strong association between the *Ownership* variables D_{pr} , D_{pm} , D_{pb} , D_{po} ; *Efficiency-DEA* and *Efficiency-SFA*; *Leverage*, *Size*, *Country* and *Regulation*; and also between *Size* and *Age*. Therefore, for the ownership structure dummy variables, widely-held (public) stock micro-life insurers D_{pr} , are analysed separately from the subsets of closely-held (private) stock firms, D_{pm} , D_{pb} , D_{po} . The cost efficiency estimates, *Efficiency-DEA* and *Efficiency-SFA* are also analysed separately. *Country* and *Regulation* are highly negatively correlated (Pearson/Spearman correlation coefficients are, $-0.99/0.87$, $p \leq 0.01$, two-tailed test), thus *Country* is excluded from the regressions to avoid possible multicollinearity²⁹.

Variance inflation factors (VIFs) are computed for all the explanatory variables (see table 6.3) in the regression model to ensure that the presence

²⁹ *Country* is excluded from the regression to avoid multicollinearity. However, the *Regulation* variable is retained to also serve as a surrogate for the country-specific effects, especially as the values for *Regulation* do not overlap for the two countries (see Table 6.1).

of multicollinearity will not bias the significance of the parameter estimates. The VIF³⁰ measures the amount by which the variance of an estimated coefficient is increased due to its linear association with explanatory variables. Multicollinearity is not a problem in the regression if the estimated VIF of the explanatory variable is less than 10 (Kennedy, 2003). The VIFs for all the independent and control variables are shown in Table 6.3. The calculated VIFs are all less than 4. Therefore, multicollinearity does not pose a severe econometric problem in the present study.

Table 6.3: Variance Inflation Factors (VIFs)

Variable	DEA		SFA	
	VIF		VIF	
<i>Efficiency</i>	1.28	1.21	1.72	1.54
<i>Ownership: D_p</i>	-	1.73	-	1.72
<i>D_{pm}</i>	2.59	-	2.54	-
<i>D_{pb}</i>	1.59	-	1.52	-
<i>D_{po}</i>	1.81	-	1.99	-
<i>Leverage</i>	2.01	1.98	2.09	2.07
<i>Reinsurance</i>	1.12	1.11	1.51	1.50
<i>Regulation</i>	3.57	3.30	3.40	3.09
<i>Size</i>	2.94	2.70	2.94	2.69
<i>Product Mix</i>	1.19	1.17	1.17	1.14
<i>InAge</i>	1.68	1.62	1.73	1.65
<i>Interest</i>	1.17	1.17	1.17	1.16
<i>Reinsurance x Leverage</i>	1.58	1.56	1.56	1.54

Source: Research Data. This table presents the VIFs for all of the independent and control variables for the years 2005-2010. *Profit* is the annual profitability-the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t - 1$. *Efficiency-DEA* is the cost efficiency estimates derived using DEA in a first-stage analysis (see section 5.3.1). *Efficiency-SFA* is the cost efficiency estimates derived using SFA in a first-stage analysis (see section 5.3.2). *Ownership* represents the ownership structure variables; D_p , D_{pm} , D_{pb} , D_{po} where $D_p = 1$ for widely-held (public) stock micro-life insurers, and 0 for private (closely- held) stock micro-life insurer, $D_{pm} = 1$ for micro-life insurers with shareholding closely-held by managers, and 0 otherwise, $D_{pb} = 1$ for micro-life insurers with shareholding closely-held by Banks, and 0 otherwise, $D_{po} = 1$ for micro-life insurers with shareholding closely-held by 'others' (such as insurance companies, financial companies, and mutual funds), and 0 otherwise. *Leverage* is the total liabilities-to- surplus ratio. *Reinsurance* is the ratio of gross premium written ceded to the reinsurer. *Regulation* denotes the regulatory environment which is proxied using the country-specific annual percentile rank of the regulatory quality index of the Worldwide Governance Indicators (WGI) .The regulatory quality index captures the perceptions of the ability of the government to formulate and implement sound policies and regulations that promote private sector development. *Size* is the natural logarithm of total admitted assets. *Product Mix* is the line of business Herfindahl index, which measures the product diversification of the micro-life insurer. *InAge* is the natural logarithm of the length of time of operations of a firm in the micro-insurance market. *Interest* is the country-specific annual commercial bank lending rate.

³⁰ VIF is calculated by regressing each independent variable in turn on other independent variables, and then calculating $1/(1-R^2)$ (Kennedy, 2003).

6.4 Multivariate Results

This section presents the results for the model specified in equation [5.10]. The four main hypotheses, developed in chapter 4, are tested using the FGLS methodology as explained in chapter 5, section 5.7. Table 6.4(A) reports the parameter estimates and test statistics for the base model in which the direct effects are employed in the regression analyses while Table 6.4(B) presents the corresponding results when the interaction term is included in the model. The Wald chi-square test is statistically significant (p -value <0.01) in all the models considered and thus rejects the null hypothesis that all the regression coefficients across the models are simultaneously equal to zero. However, a comparison of the results presented in Table 6.4(A) & (B) reveals a reduction in the Wald chi-square test statistic when the interaction term, (*Reinsurance x Leverage*) is added to the base model.

Cost Efficiency: Consistent with hypothesis H1a, and the results from the bivariate analysis, the coefficient estimate for *Efficiency* is positive and statistically significant (p -value <0.01 , one-tailed test) for both the DEA and SFA cost efficiency estimates. As noted previously, micro-life insurance is by design a low-premium product, and the proportion of the premium that must go to pay for expenses (as opposed to payment for covered losses) is higher than in conventional insurance. Therefore, given the relatively low average annual profitability (9%), the results suggest that efficiency is economically significant, and so cost efficient micro-life insurers are likely to be more profitable than cost inefficient firms. In addition, the results are consistent with prior literature such as Greene and Segal (2004) who find a negative association between cost inefficiency and annual profitability in the US life insurance industry. Choi and Weiss (2005) also obtain a significant positive relation between cost efficiency and annual profitability, and contend that higher profits are earned by relatively more cost efficient firms. Furthermore, Appendix D and E present the results of the model using technical and allocative efficiency respectively. Consistent with hypotheses H1b and H1c, the coefficient estimates for technical efficiency is positive and statistically significant (p -value <0.01 , one-tailed test) in both the DEA and SFA models.

Table 6.4(A): Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation.

	I. DEA				II. SFA			
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
<i>Intercept</i>	0.225	0.042***	0.223	0.036***	-0.383	0.058***	-0.364	0.052***
<i>Efficiency</i>	0.082	0.178***	0.077	0.016***	0.729	0.051***	0.717	0.052***
<i>Ownership: D_p</i>	-	-	-0.015	0.013	-	-	-0.001	0.009
<i>D_{pm}</i>	0.010	0.018	-	-	0.008	0.013	-	-
<i>D_{pb}</i>	0.019	0.015	-	-	0.017	0.011	-	-
<i>D_{po}</i>	0.014	0.023	-	-	0.004	0.021	-	-
<i>Leverage</i>	0.013	0.002***	0.013	0.002***	0.011	0.002***	0.011	0.002***
<i>Reinsurance</i>	-0.197	0.039***	-0.191	0.038***	-0.152	0.031***	-0.158	0.029***
<i>Regulation</i>	0.037	0.051	0.046	0.050	0.032	0.041	0.029	0.037
<i>Size</i>	-0.007	0.003**	-0.006	0.003**	-0.007	0.003**	-0.006	0.002***
<i>Product Mix</i>	-0.077	0.026***	-0.087	0.025***	-0.045	0.020**	-0.045	0.018***
<i>lnAge</i>	-0.020	0.009**	-0.021	0.008***	-0.015	0.08**	-0.018	0.008**
<i>Interest</i>	-0.501	0.279*	-0.534	0.278*	0.339	0.229	-0.358	0.221*
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>Wald test</i>		255.95***		197.74***		484.12***		366.48***
<i>Obs.</i>		282		282		282		282

Source: Research Data. This table reports the results of the feasible generalised least squares (FGLS) regressions. The DEA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the stochastic frontier analysis. The dependent variable is the annual profitability, *Profit* -the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t - 1$. All remaining variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

Table 6.4(B): Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation- including the Interaction term.

	I. DEA				II. SFA			
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
<i>Intercept</i>	0.235	0.043***	0.234	0.038***	-0.401	0.061***	-0.370	0.053***
<i>Efficiency</i>	0.078	0.018***	0.074	0.017***	0.749	0.054***	0.726	0.053***
<i>Ownership: D_p</i>	-	-	-0.017	0.013	-	-	-0.002	0.010
<i>D_{pm}</i>	0.006	0.018	-	-	0.006	0.014	-	-
<i>D_{pb}</i>	0.021	0.015	-	-	0.018	0.012	-	-
<i>D_{po}</i>	0.015	0.022	-	-	0.004	0.019	-	-
<i>Leverage</i>	0.016	0.002***	0.015	0.002***	0.012	0.002***	0.012	0.002***
<i>Reinsurance</i>	-0.213	0.042***	-0.205	0.041***	-0.162	0.031***	-0.165	0.030***
<i>Regulation</i>	0.029	0.050	0.039	0.049	0.019	0.039	0.021	0.036
<i>Size</i>	-0.006	0.003**	-0.007	0.003**	-0.006	0.003**	-0.006	0.002**
<i>Product Mix</i>	-0.091	0.027***	-0.099	0.025***	-0.049	0.022**	-0.052	0.019***
<i>lnAge</i>	-0.019	0.009**	-0.021	0.008***	-0.015	0.008*	-0.019	0.008***
<i>Interest</i>	-0.542	0.287*	-0.576	0.288*	0.263	0.243	-0.314	0.237
<i>Reinsurance x Leverage</i>	-0.026	0.010**	-0.023	0.009**	-0.028	0.008***	-0.026	0.008***
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>Wald test</i>		150.71***		137.40***		416.21***		344.83***
<i>Obs.</i>		282		282		282		282

Source: Research Data. This table reports the results of the feasible generalised least squares (FGLS) regressions. The DEA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the stochastic frontier analysis. The dependent variable is the annual profitability, *Profit* -the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t - 1$. All remaining variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

The coefficient estimates for allocative efficiency is also positive and statistically significant (p -value <0.01 , one-tailed test) in the SFA model. Therefore, the results suggest that micro-life insurers which are efficient in their production (service) technology and allocation of resources are likely to obtain higher profits.

Ownership structure: Contrary to what was hypothesised in H2a-H2d, and the bivariate results, no statistically significant relation is found between the *Ownership* variables, D_{pr} , D_{pmr} , D_{pb} , D_{po} and *Profit* in both the DEA and SFA regression models. A positive but statistically insignificant coefficient estimate is obtained for widely-held (public) micro-life insurers D_{pr} , while a negative but statistically insignificant coefficient estimate is obtained for all the three variations of the closely-held (private) micro-life insurers, D_{pmr} , D_{pb} , D_{po} . The results suggest that the ownership structure of micro-life insurers has no significant impact on their annual profitability. However, the results are not surprising as prior literature on the impact of ownership structure on firm performance has also yielded mixed results. For example, Demsetz and Villalonga (2001) find no evidence to support the notion that variation in the observed ownership structures across firms in results in systematic variations in performance.

Leverage: Consistent with the bivariate results, and hypothesis H3a, a positive and statistically significant relation (p -value <0.01 , two-tailed test) is obtained for *Leverage* in both the DEA and SFA regressions³¹. This suggests that the increasing use of debt maximises the profitability of micro-life insurance firms. The result is also consistent with the free cash-flow hypothesis of Jensen (1986) which argues that the use of debt could be value enhancing for firms as it acts as a disciplinary device to ensure that managers pursue the strategic goals of the shareholders. Furthermore, the results lends support to the findings of prior research (e.g., see Grossman & Hart, 1982; Stulz, 1990) which contend that the increasing use of debt helps to mitigate the problems of overinvestment which arises when managers expend the firms' free cash flow on self-utility maximising projects.

³¹ On the other hand, contrary to the results of prior research (e.g., Purnanandam, 2008), the present study finds no support for the non-linear relation between leverage and profitability. The coefficient estimates using *Leverage*² are negative but statistically insignificant in both the DEA and SFA regressions.

Reinsurance: As hypothesised in H4b, a negative and statistically significant (p -value < 0.01, two-tailed test) coefficient estimate is obtained between *Reinsurance* and *Profit* in both the DEA and SFA regressions, suggesting that the purchase of reinsurance has a negative impact on the profitability of micro-life insurers. The result is also consistent with the findings of prior studies which contend that the costly nature of reinsurance, especially for micro-life insurers, could result in lower profitability. For example, Olaosebikan (2013) in a study of Nigerian micro-life insurers concludes that the cost of reinsurance is likely to be highly priced to reflect the increased risk of insuring low-income groups. Furthermore, Jean-Baptiste and Santomero (2000) also contend that the reinsurers' lack of information regarding the risk being transferred, and control over the ultimate outcome of risk results in higher reinsurance premiums, which could therefore lower the expected profitability of the ceding insurer.

Interaction term: Interestingly, a negative and statistically significant (p - value <0.01, two- tailed test) association is found between the interaction term, *Reinsurance x Leverage* for both the DEA and SFA models, suggesting that the relation between *Leverage* and *Profit* appears to decline as *Reinsurance* increases. Prior studies (e.g., Adams et al., 2008; Garven & Lamm-Tennant, 2003) find a positive relation between high leverage and reinsurance, and argue that firms with higher leverage tend to purchase more reinsurance in order to mitigate the risk of severe catastrophic loss. Therefore, the result obtained in the present study implies that the high cost of reinsurance for micro-life insurers possibly outweighs its potential benefit of mitigating the probability of bankruptcy induced at high leverage.

Control Variables: The regression models also controls for other firm-/country-specific effects namely: regulation, firm size, product mix, age, and interest rates. The coefficient estimates for *Regulation* is positive but statistically insignificant in both the DEA and SFA regression models. This observation indicates that the ability of the government to formulate and implement sound policies and regulations that promote the development of the private sector has no significant impact on the annual profitability of micro-life insurers. For firm size, a negative and statistically significant association is found between *Size* and *Profit* for both the DEA (p -value

<0.01, two-tailed test) and SFA (p -value <0.10, two-tailed test) regressions. This result is consistent with the findings of Biener and Eling (2011) and suggests that smaller micro-life insurers have better annual profitability than larger micro-life insurance firms. Furthermore, *Product Mix* is negative and statistically significant (p -value <0.01, two-tailed test) in both the DEA and SFA regressions. Therefore, consistent with the findings of prior literature (e.g., Abdul Kader et al., 2010), the results suggests that micro-life insurers with multi-product lines of business are more profitable than mono-line micro-life insurers, as they are able to benefit from both the economies of scale, as well as the economies of scope in the use of shared inputs (e.g., labour, technology, and so on). Consistent with the bivariate results, the coefficient estimate of *lnAge* is negative and statistically significant (p -value <0.05, two-tailed test) in both the DEA and SFA regressions. The result is also consistent with the findings of Biener and Eling (2011), and implies that micro-life insurers which have been operating in the micro-insurance market for longer periods have lower annual profitability. For *Interest*, a negative and weak statistically significant (p -value <0.10, two-tailed test) coefficient estimate is obtained only in the DEA regression. This result is consistent with that cited in Doherty and Garven (1995), and implies that the profit margins of micro-life insurers are inversely related to the movement of average annual interest rates in the economy.

The empirical results for the separate country analyses of Nigerian and South African micro-life insurers are presented in Table 6.5(A) and 6.5(B) respectively.

Cost Efficiency: Consistent with hypothesis (H1a), and the findings of prior literature (e.g., Choi & Weiss, 2005; Greene & Segal, 2004), Table 6.5(A) shows that for the Nigerian dataset, the coefficient estimates of *Efficiency* are positive and statistically significant (p -value <0.01, one-tailed test) for both the DEA and SFA regressions. The coefficient estimates of efficiency are also positive and statistically significant (p -value <0.01, one-tailed test) in both the DEA and SFA models for South African micro-life insurers, as shown in table 6.5(B).

Table 6.5(A): Nigeria: Analysis of the Profitability of Micro-Life Insurers; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation.

	I. DEA				II. SFA			
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
<i>Intercept</i>	-0.308	0.088***	-0.299	0.083***	-0.515	0.096***	-0.468	0.087***
<i>Efficiency</i>	0.259	0.033***	0.277	0.034***	0.749	0.084***	0.745	0.078***
<i>Ownership: Dp</i>	-	-	-0.029	0.013	-	-	-0.014	0.011
<i>Dpm</i>	0.058	0.016***	-	-	0.038	0.017**	-	-
<i>Dpb</i>	0.035	0.014	-	-	0.024	0.012	-	-
<i>Dpo</i>	-0.015	0.019	-	-	-0.017	0.021	-	-
<i>Leverage</i>	0.056	0.008***	0.053	0.008***	0.051	0.009***	0.051	0.009***
<i>Reinsurance</i>	0.035	0.232	0.049	0.229	0.303	0.252	0.238	0.254
<i>Regulation</i>	-	-	-	-	-	-	-	-
<i>Size</i>	0.042	0.008***	0.045	0.008***	0.003	0.004*	0.001	0.003*
<i>Product Mix</i>	-0.055	0.032**	-0.026	0.027	-0.023	0.026	-0.015	0.013
<i>InAge</i>	-0.031	0.010***	-0.037	0.009***	-0.039	0.010***	-0.037	0.009***
<i>Interest</i>	-	-	-	-	-	-	-	-
<i>Reinsurance x Leverage</i>	0.035	0.098	0.004	0.098	0.176	0.107	0.147	0.106
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>Wald test</i>		292.25***		238.24***		291.35***		281.50***
<i>Obs.</i>		122		122		122		122

Source: Research Data. This table reports the results of FGLS regressions for the Nigerian dataset. The DEA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the stochastic frontier analysis. The dependent variable is the annual profitability, Profit -the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t-1$. All remaining variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

Table 6.5(B): South Africa: Analysis of the Profitability of Micro-Life Insurers; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation.

	I. DEA				II. SFA			
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
<i>Intercept</i>	0.426	0.071***	0.406	0.054***	-0.137	0.113	-0.121	0.230
<i>Efficiency</i>	0.069	0.033**	0.043	0.030*	0.580	0.102***	0.561	0.104***
<i>Ownership: Dp</i>	-	-	-0.064	0.026	-	-	-0.028	0.027
<i>Dpm</i>	0.069	0.031	-	-	0.045	0.023	-	-
<i>Dpb</i>	-0.054	0.023	-	-	-0.008	0.018	-	-
<i>Dpo</i>	0.024	0.033**	-	-	0.104	0.034***	-	-
<i>Leverage</i>	0.015	0.002***	0.014	0.002***	0.013	0.002***	0.012	0.002***
<i>Reinsurance</i>	-0.404	0.068***	-0.389	0.072***	-0.281	0.067***	-0.302	0.068***
<i>Regulation</i>	-	-	-	-	-	-	-	-
<i>Size</i>	-0.019	0.005***	-0.018	0.004***	-0.012	0.004***	-0.012	0.004**
<i>Product Mix</i>	-0.103	0.039***	-0.131	0.034***	-0.103	0.038***	-0.100	0.035***
<i>lnAge</i>	-0.001	0.013	-0.009	0.012	-0.080	0.011	-0.015	0.011
<i>Interest</i>	-	-	-	-	-	-	-	-
<i>Reinsurance x Leverage</i>	-0.001	0.012	-0.005	0.012	-0.026	0.010**	-0.016	0.010
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>Wald test</i>		168.25***		145.47***		192.39***		182.42***
<i>Obs.</i>		160		160		160		160

Source: Research Data. This table reports the results of the feasible generalised least squares (FGLS) regressions for the South African dataset. The DEA column gives the results for the regressions in which the cost efficiency (Efficiency) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the cost efficiency (Efficiency) are derived using the stochastic frontier analysis. The dependent variable is the annual profitability, Profit -the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and t - 1. All remaining variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

Albeit, the overall results suggest that cost efficient micro-life insurers in both Nigeria and South Africa are likely to be more profitable than firms which are not cost efficient.

Ownership Structure: The impact of *Ownership* on *Profit* produce mixed results for the two countries. For the Nigerian dataset, table 6.5(A) shows a positive and statistically significant (p -value <0.05 , two-tailed test) for the coefficient estimate of the *Ownership* variable, D_{pm} . This result is consistent with the findings of Cummins and Sommer (1996), and suggests that micro-life insurers with stock closely held by managers, D_{pm} are likely to be more profitable compared to firms closely-held by large banks, D_{pb} as well as firms closely-held by other institutional investors, D_{po} . The higher profitability could be attributed to the closer merger of the owner-manager functions which helps to lower the agency costs of monitoring and control. On the other hand, Table 6.5(B) shows that for South African micro-life insurers, the coefficient estimate of the *Ownership* variable, D_{po} is positive and statistically significant (p -value <0.01 , two-tailed test), thus suggesting that compared to firms closely-held by management, D_{pm} or large Banks, D_{pb} , micro-life which are closely-held other institutional investors such as insurance companies, mutual funds etc. are likely to be more profitable. The result is consistent with the findings of Shleifer and Vishny (1986) who contend that large (non-management) shareholder-owner of firms could serve as effective monitors because they have a lower marginal cost of acquiring and disseminating information.

Leverage: In Tables 6.5(A) and 6.5(B), the estimated coefficient for *Leverage* is positive and statistically significant (p -value <0.01 , two- tailed test) for both countries. This result is consistent with hypothesis H3a, and suggests that the increasing use of leverage has a positive impact on the profitability both Nigerian and South African micro-life insurers. This result further highlights the advantages of leverage in the disciplining managers to maximize shareholder wealth by generating free cash flows (Harris & Raviv, 1990; Jensen, 1986).

Reinsurance: Interestingly, the coefficient estimates of *Reinsurance* for Nigerian micro-life insurers - see Table 6.5(A) - are positive but statistically

insignificant in both the DEA and SFA models. On the other hand, the results reveal a negative and statistically significant (p -value <0.01 , two-tailed test) coefficient estimate in both the DEA and SFA model for South African micro-life insurers - see Table 6.5(B). Overall, the results are mixed and suggest that the increasing use of reinsurance is a statistically significant driver of the profitability of South African micro-life insurers. This result further suggests that the riskiness of micro-life insurance policies is reflected in the high cost of reinsurance for South African firms. However, no empirical support is obtained for the impact of reinsurance on the profitability of Nigerian micro-life insurers.

Interaction term: The impact of the interaction term, *Reinsurance* \times *Leverage* produces mixed results for both countries. In Table 6.5(A), positive but statistically insignificant coefficient estimates are obtained for Nigerian micro-life insurers, thus providing no support for the interactive effects of reinsurance and leverage on annual profitability. On the other hand, the coefficient estimates of the interaction term are negative and statistically significant (p -value <0.05 , two-tailed test) in the SFA model for South African micro-life insurers. This observation indicates that for South African micro-life insurers, the relation between *Leverage* and *Profit* appears to decline as *Reinsurance* increases. The results are interesting because they imply that for South African micro-life insurers, the high cost of reinsurance outweighs the costs of bankruptcy induced at high leverage.

Control Variables: The regression models also controls for other firm-/country-specific effects namely: firm size, product mix, and age³². The estimated coefficients for *Size* is positive and statistically significant (p -value <0.10 , two-tailed test) for Nigerian micro-life insurers. In line with the findings of Hardwick (1997), this result suggests that larger micro-life insurers in Nigeria have higher profitability than smaller micro-life insurance firms due to their ability to efficiently diversify assumed risks and realise economies of scale. On the other hand, the estimated coefficients for *Size* is negative and statistically significant (p -value <0.05 , two-tailed test) for

³² The *Regulation* and *Interest* variables are omitted from the regression equation for both the Nigerian and South African data-set (see Table 6.5(A) and Table 6.5(B)). This is due to the presence of multicollinearity which could result in biased parameter estimates.

South African micro-life insurers. Consistent with the findings of prior studies (e.g., Adams & Buckle, 2003; Biener & Eling, 2011), this result suggest that the social cohesion as well as the relatively smaller information asymmetries and agency costs results in a higher profitability for smaller micro-life insurers in South Africa. The estimated coefficients for *Product Mix* is negative but only statistically significant (p -value < 0.05 , two-tailed test) in the DEA regressions while the estimated coefficients are negative and statistically significant (p -value < 0.01 , two-tailed test) in both the DEA and SFA models. Consistent with the findings of prior literature (e.g., Abdul Kader et al., 2010; Mathewson, 1983) , the results indicate that for both Nigeria and South Africa, multi-product micro-life insurers are likely to benefit not only from economies of scale but also from economies of scope in the use of shared inputs. Furthermore, *InAge* produces negative and statistically significant (p -value ≤ 0.01 , two-tailed test) coefficient estimates for Nigerian micro-life insurers while negative but statistically insignificant coefficient estimates are obtained for South African micro-life insurers. This result implies that micro-life insurance firms which have been operating for a longer period in the Nigerian market have lower profitability than younger micro-life insurers.

6.5 Robustness Tests

To test the robustness of the regression results presented in Table 6.4, two main diagnostic tests are conducted. The first test is based on omitting the *Regulation* variable from the regressions, as it gives the highest VIF values in all the models considered (see Table 6.3). The second test is based on employing the pooled ordinary least squares (OLS), and the final test is conducted using the fixed-effects estimation techniques.

As discussed in section 6.3 of the present chapter, a statistically significant positive correlation is found between the *Regulation* and *Size* variables (i.e., Pearson/Spearman correlation is 0.57/0.53, $p < 0.01$, two-tailed test) as well as the *Regulation* and *Leverage* variables (i.e., Pearson/Spearman correlation is 0.47/0.62, $p < 0.01$, two-tailed test). Consequently, the

computed VIFs - see Table 6.3 –again reveals that multicollinearity does not pose a severe econometric problem in the present study as the values obtained were all below the acceptable threshold of 10 (Kennedy, 2003). Multicollinearity can cause the t-tests to be under-estimated and the resultant p-values to be over-estimated (Gujarati, 1999). Therefore, to further alleviate concerns about multicollinearity, a robustness test is conducted by omitting *Regulation* from the regression model.

Appendix F presents the results for the regressions omitting the *Regulation* variable. The regression results obtained after omitting the *Regulation* variable in both the DEA and SFA models are consistent with the results of the main regressions as reported in Table 6.4. The coefficients estimates are consistent in the different regression specifications, and the signs of the estimated coefficients do not change. *Leverage* remains positive and statistically significant (p -value ≤ 0.01 , two-tailed test), *Size* also remains negative and statistically significant (p -value ≤ 0.01 , two-tailed test), and the p -values are improved in all the models considered. In addition, *Interest* remains negative and statistically significant (p -value ≤ 0.10 , two-tailed test) in the DEA model. The results of the regressions with the omitted *Regulation* variable (Appendix E) indicate that multicollinearity does not change the main results, and is therefore not a serious problem in the present study.

For the second robustness test, a pooled ordinary least squares (OLS) estimation is employed. As discussed in section 5.7, the Wald F-statistic rejects the null hypothesis of no firm or period specific effects in the sample data. The null hypothesis of the Wooldridge (2002) test of no first-order serial correlation is also rejected. Therefore, fixed/year dummies are included to capture the period-specific effects, and the standard errors are clustered at the firm level to control for firm-specific effects. Greene (2003) contends that *Efficiency* variables can be subject to measurement error, because they are predicted from the stochastic frontier/data envelopment procedures (see Chapter 5, section 5.3). Thus, following prior research (e.g., Choi & Weiss, 2005) *Efficiency* is assumed to be endogenous, and the ranks of the efficiency scores for both the *Efficiency-DEA* and *Efficiency-SFA* are employed as instrumental variables to control for endogeneity. The Durbin-

Wu-Hausman test for the endogeneity of *Efficiency-DEA* generated a chi-square (χ^2) statistics of 2.33/2.43 (p -value > 0.10) fails to reject the null hypothesis that *Efficiency-DEA* is exogenous. However, *Efficiency-SFA* generated a chi-square (χ^2) statistics of 28.90/29.21 (p -value < 0.01), and so rejects the null hypothesis that *Efficiency-SFA* is exogenous. Nonetheless, the instrumental variables are included in both the DEA and SFA regression.

Appendix G reports the results for the regressions using the pooled OLS estimation. The results obtained using the pooled OLS estimation in both the DEA and SFA models are fairly consistent with the results of the FGLS (baseline) regressions as reported in Table 6.4. The coefficient estimates of *Efficiency* in both the DEA and SFA models are positive and statistically significant (p -value ≤ 0.05 , one-tailed test), lending support for hypothesis H1a. This result is consistent with the FGLS (baseline) results, and the findings of prior research (e.g., Choi and Weiss, 2005) which suggest that cost-efficient micro-life insurers have higher profitability than cost-inefficient firms. The *Ownership* dummy variable is statistically insignificant in all the models employed, indicating that ownership structure does not have a significant impact on the profitability of micro-life insurers. The estimated coefficients for *Leverage* are positive and statistically significant (p -value ≤ 0.05 , two-tailed test) in all the regression models, and consistent with hypothesis H3a. Consistent with the FGLS (baseline) results, the coefficient estimates of *Reinsurance* are negative and statistically significant (p -value ≤ 0.01 , two-tailed test) in both the DEA and SFA models. The interaction term, *Reinsurance* \times *Leverage*, remain negative and statistically significant (p -value ≤ 0.05 , two-tailed test). For the control variables, *Regulation* becomes positive and weakly statistically significant (p -value ≤ 0.10 , two-tailed test) further suggesting that the ability of the government to formulate and implement sound policies and regulations that promote the development of the private sector 'improves' the annual profitability of micro-life insurers. The coefficient estimates for *Size* and *Product Mix* are negative and statistically significant (p -value ≤ 0.10 , two-tailed test) in all the models considered and consistent with the baseline results. Furthermore, contrary to the FGLS results, the estimated coefficients for *InAge* and *Interest* are negative and statistically insignificant in all the regression models.

6.6 Summary and Conclusion

This chapter presents the empirical results obtained from the statistical analysis of the Nigerian and South African micro-life insurance industry using a panel data covering the period 2005-2010. Using FGLS methodology, four main hypotheses were tested using DEA and SFA cost efficiency estimates obtained in a first-stage analysis as described in chapter 5, section 5.3. Consistent with what was hypothesised, the empirical results of the for the pooled data of Nigerian and South African micro-life insurers indicate that the ability to control costs is statistically significant, and that cost efficient micro-life insurance firms are likely to be more profitable than less cost inefficient firms. In addition, the results obtained when the model is analysed using the split components of cost efficiency - technical and allocative efficiency- reveal that efficiency in the use production/service technology as well as efficient resource allocation are significant drivers of the profitability of micro-life insurers in Nigeria and South Africa. As in prior research, no statistically significant result is obtained for the ownership structure variables, suggesting that the ownership structure has no significant impact on the annual profitability of micro-life insurers. Furthermore, the increasing use of leverage was found to be value-enhancing for micro-life insurance firms suggesting that leverage helps to mitigate agency conflicts, and reduce the amount of free-cash flow available to managers to pursue self-utility maximising objectives. On the other hand, reinsurance was found to have a negative impact on the profitability of micro-life insurers in Nigeria and South Africa, not surprisingly so given the regulatory restrictions and high cost of reinsurance especially in Nigeria. In addition, the interaction of reinsurance and leverage was found to have a negative impact on the profitability of micro-life insurers. Specifically, at high leverage levels, the annual profitability of micro-life insurers appears to decline as the purchase of reinsurance increases. The empirical results further confirm that the regulatory environment has no significant impact on profitability. Smaller and younger micro-life insurers were found to be more profitable, and diversification into multi-product lines was also found to be profit maximising. Finally, high interest rates in the economy were found to have a

weak negative impact on profitability. The main conclusions with regards to the key determinants of the profitability of micro-life insurers in Nigeria and South Africa are summarised, and their implications for commercial and public policy-making are considered in the next and final chapter of this thesis.

Chapter 7

Summary and Conclusions

7.1 Introduction

This chapter summarises the research results and presents the main conclusions and implications arising from the study. In addition, the contribution of the research and the limitations of the study are highlighted. The consideration of potential areas for future research is also outlined in this final chapter of the thesis.

7.2 Overview of the Project

The extant literature on micro-insurance (e.g., see Dercon et al., 2008; Koven & Zimmerman, 2011) highlights the key demand and supply-side factors affecting the business success and take-up of micro-insurance in developing countries. Some of the key issues include regulatory constraints, cost-effective distribution channels, risk assessment and pricing, market demand, consumer education, and role of reinsurers. Using a case studies approach, Angove and Tande (2011) examine how profitability can be measured, and the level of success of certain micro-insurance programmes. However, very few quantitative analyses have been conducted to determine the specific factors that drive the profitability of micro-insurance programs. Biener and Eling (2011) were the first researchers to quantitatively examine the efficiency of micro-insurance programs. They examined the performance of micro-insurance programs using frontier efficiency approach, and find significant potential for improvement in terms of the productivity and operational efficiency. Thus, motivated by prior research, the present study analyses the determinants of the profitability of commercial micro-life insurance providers in Nigeria and South Africa. Specifically, the study puts forward two main research questions:

- *Research Question 1:* Can micro-life insurance be profitable for commercial insurance providers?
- *Research Question 2:* What are the specific quantitative factors that drive business success/profitability of commercial micro-life insurance providers?

The research focuses on the micro-life insurance industry because in contrast to non-life insurance policies (e.g., on crops, property, and health), life insurance is the predominant line of micro-insurance business in developing countries accounting for approximately 30% of policies sold which is largely driven by the lending activities micro-finance institutions (Lloyd's of London, 2009). In addition, life insurance products are more compliant with the fundamentals of insurability and are generally easy to provide relative to other business lines (Biener & Eling, 2012). Hence, the attributes of micro-life insurance allows potentially 'cleaner' tests of the research hypotheses to be carried out. Furthermore, Nigeria and South Africa – the two largest economies of sub-Sahara Africa - are considered to be good environments to conduct the present study based on the physical, economic, and regulatory landscape, as well as the salient features of the micro-insurance market. The institutional context of both Nigeria and South Africa are discussed in detail in chapter 2.

Furthermore, the present study critically reviewed the theoretical and empirical literature relating to micro-insurance and financial performance in order to address the research questions put forward. In particular, the study examines the origin, definition and perspectives of micro-insurance; the differences between micro-insurance and conventional insurance; and micro-life insurance product-types. The literature on transaction costs, information asymmetry, reinsurance and leverage are also critically reviewed in chapter 3. Drawing a framework from the review of academic literature, four main research hypotheses regarding the linkages between profitability, cost efficiency, ownership structure, reinsurance, and leverage are then put forward to address the research questions in Chapter 4.

The data for empirical analyses, covering the six years between 2005 and 2010 were obtained from the annual reports and accounts provided by the insurance regulator in the two countries. For Nigeria, annual data are compiled by the NIA and submitted to the insurance industry regulator, NIACOM. For South Africa, annual data are filed with the local insurance industry regulator, FSB. In situations where data on micro-life insurance business are unavailable from published sources, required data are obtained directly from internal company sources through authorized direct access and/or by interview with technical managers. The period of analysis (i.e., 2005-2010), represents the earliest and latest years for which complete data were available to enable the research to be completed in a timely manner.

Following prior research (e.g., Cummins & Zi, 1998; Eling & Luhnen, 2010a), both the mathematical programming (DEA) and econometric (SFA) frontier efficiency estimation techniques are employed in the computation of cost efficiency estimates in a first-stage analyses. This procedure enables one to examine the potential effects of using different frontier efficiency techniques on the derived cost efficiency estimates. Furthermore, the FGLS methodology is employed to test the empirical hypotheses put forward in the fourth chapter of this thesis. The FGLS has been identified as the most appropriate estimation procedure for handling the simultaneous presence of heteroskedasticity and serial correlation (Grace & Leverty, 2012). In addition, the FGLS estimation technique permits the inclusion of firm/year dummies to control unobserved heterogeneity (e.g., variation in management quality) as well as time-effects (e.g., changes in unobserved macroeconomic factors) in the sample firms. The research design and model specification are outlined in Chapter 5 of the thesis.

The key aggregate features of the dependent, independent and control variables as well as the associations between pairs of each variable are presented in Chapter 6. The FGLS regression analysis was employed to determine the simultaneous effects of cost efficiency, ownership structure, leverage and reinsurance on the financial profitability of micro-life insurance firms while concomitantly controlling for time-effects and firm-specific effects. In addition, regression analyses were conducted separately for the Nigeria and South Africa dataset to highlight differences in the profitability of

micro-life insurers in the two countries. The empirical results of the regression analyses are also presented in Chapter 6. Section 7.3 below now discusses the main conclusions and implications arising from the empirical analysis.

7.3 Research Conclusions and Implications

The micro-insurance market has received growing interest from local and international commercial insurers in recent years. The achievement of sustained profitability is a key strategic goal for most commercial players, especially for international firms who are seeking new growth opportunities away from the saturated traditional markets (Koven and Zimmerman, 2011). Despite its huge market potential of up to 2-3 billion policies globally and prospective in-force business value estimated at US\$40 billion, the viability of most schemes/products is still questionable (Swiss Re, 2010). The extant literature on micro-insurance highlights the supply and demand factors affecting the penetration and viability of micro-life insurance. However, few studies have quantitatively examined the factors that drive the profitability of micro-life insurance firms. The pioneering study of Biener and Eling (2011) identify profit-orientation, size, age, and policy-type as the drivers of the efficiency of micro-insurance programs. They found that large non-profit firms which have been active in the micro-insurance markets for a longer period were inefficient. However, the use of group policies was found to be a statistically significant driver of performance in micro-life insurers. Therefore, drawing a framework from the financial economics and micro-insurance literature, the present study posits that cost efficiency, ownership structure, leverage, and risk management decisions (i.e., reinsurance) are likely to be important drivers of the profitability of micro-life insurers in Nigeria and South Africa. The main conclusions from the empirical analysis for the pooled data-set of Nigerian and South African micro-life insurers, as well as the results of the separate country analysis are discussed below.

The first main conclusion of the study is that the sample of Nigerian and South African micro-life insurers considered in the present study are on

average profitable, with South African firms having a slightly higher average profitability than Nigerian firms - see Table 6.1.

The second main conclusion is that some of the results obtained from the data analyses are consistent with what was hypothesised and support the findings of previous research. For instance, in the first-stage analysis of the efficiency estimates (i.e., cost, technical and allocative efficiency) using the two main frontier efficiency techniques (i.e., DEA and SFA), the results reveal that efficiency estimates obtained using the mathematical programming (DEA) approach are lower than the estimates obtained using the econometric (SFA) approach (see Appendix A). These findings are as expected, and consistent with the results of prior literature (e.g., Cummins & Zi, 1998) which use multiple frontier efficiency methods. The efficiency estimates derived using the DEA are expected to be lower than the estimates derived using the SFA, because the DEA measures all the random departures from the frontier as inefficiency, while the SFA separates the departures from the frontier into the inefficiency and random error components - see chapter 5, section 5.3. Furthermore, in line with prior research (e.g., Cummins & Zi, 1998; Eling & Luhn, 2010b), the economic insights derived using either the DEA or SFA efficiency estimates in the main regression analyses turn out to be relatively similar. These findings suggest that the efficiency estimates are not driven by specification errors as the main regression results are robust to the choice of frontier efficiency estimation technique.

In line with the first hypothesis H1a, and consistent with the results of other studies (e.g., Choi & Weiss, 2005; Greene & Segal, 2004) the regression results reveal that cost-efficiency is a significant driver of the profitability of micro-life insurers in Nigeria and South Africa. That is, micro-life insurers which are cost efficient are likely to be more profitable than cost inefficient firms. In particular, because micro-insurance products are characterised by low-premiums, and the proportion of the premium that must go to pay for expenses (as opposed to payment for covered losses) is high, any ability of the insurer to reduce per-policy (transaction) costs will yield great returns for sustained profitability. Furthermore, consistent with hypotheses H1b and H1c, the present study finds that efficiency in production technology and the

use of cost-minimizing inputs are also significant drivers of the profitability of micro-life insurers.

Furthermore, in line with the third hypothesis H3a, and the findings of prior studies (e.g., Jensen, 1986), the empirical results reveal that increasing financial leverage could be profit enhancing for micro-life insurance firms in Nigeria and South Africa. Indeed, prior research (e.g., Grossman & Hart, 1982; Stulz, 1990) contend that the use of debt could mitigate the owner-manager conflicts (and subsequent agency costs) which arise in operating and investment decisions, as the requirement to meet the repayment schedule on debt covenants disciplines managers to pursue shareholder value maximisation objectives.

The empirical results for the pooled data-set of Nigerian and South African micro-life insurers reveal that the level of reinsurance is negatively associated with annual profitability (see Table 6.4). This finding which is consistent with prior research and in line with the fourth hypothesis H4b suggests that the costly nature of reinsurance purchase reduces the annual profitability of micro-life insurers in Nigeria and South Africa. Prior research (e.g., Jean-Baptiste & Santomero, 2000; Olaosebikan, 2013) contend that the reinsurer's lack of information on the nature of risk being transferred (which is particularly high for micro-insurance due to lack of quality data), and control over the outcome of risk results in higher reinsurance premiums. Indeed, Olaosebikan (2013) contends that reinsurance in the micro-life insurance sector of the Nigerian market may be highly priced to reflect the increased risk associated with insuring the lives of low-income groups. In addition, McCord et al. (2005) observe minimal use of reinsurance in a successful micro-insurance scheme in Uganda, and highlight the importance of reinsurance in providing technical expertise to primary micro-life insurers. However, McCord et al. (2005) contend that due to the low sums assured, micro-insurers may not necessarily require significant amounts of reinsurance for risk mitigation and the regulatory requirement to hold such costly reinsurance may result in a loss of profitability.

In addition, the empirical results for the pooled data-set indicate that the interaction effects between leverage and the amount of reinsurance

purchased has a statistically significant impact on the annual profitability of micro-life insurers in Nigeria and South Africa. Contrary to the findings of prior studies (e.g., Adams et al., 2008; Garven & Lamm-Tennant, 2003) which suggest that insurers with high leverage tend to purchase more reinsurance to alleviate the costs of bankruptcy, the present study finds that the increasing purchase of reinsurance at high leverage levels actually reduces the profitability of the firm. These findings suggest that for the pooled data-set of Nigerian and South African micro-life insurers, the high cost of reinsurance outweighs its potential benefit of mitigating the expected costs of bankruptcy induced at high leverage. In other words, reinsurance has potential costs as well as risk transfer benefits, which have to be carefully considered by the managers of micro-life insurance firms.

The third main conclusion of the present study is that some of the evidence obtained from the empirical research is inconsistent with what was hypothesised. For instance, the research findings reveal no statistically significant relation between ownership structure and annual profitability of micro-life insurers in Nigeria and South Africa for all the ownership forms considered. Ownership structure is an effective tool for the control of the incentive conflicts inherent in the relationship between owners, managers and policyholders (Mayers & Smith, 1981). The empirical results are however not surprising, as prior research (e.g., see Berle & Means, 1932; Demsetz & Lehn, 1985; Demsetz & Villalonga, 2001) on the influence of ownership structure on firm performance has generated mixed results. For example, Demsetz and Villalonga (2001) find no evidence to support the argument that the variation in observed ownership structure across firms results in systemic variations in firm performance. Due to the lack of data, the present study focuses on only stock micro-life insurers, and it may well be that the inclusion of other forms of ownership such as mutual firms could provide more interesting results.

The fourth main conclusion is that institutional differences could also be important drivers of the profitability of micro-life insurers in Nigeria and South Africa. For instance, the research findings indicate that small micro-life insurers have higher annual profitability than large micro-life insurers. In line

with prior research (e.g., Adams & Buckle, 2003; Biener & Eling, 2011), a possible explanation of this observation is that profitability could be adversely affected by the enhanced information asymmetries and agency costs that arise as an organisation grows in size. Indeed, Biener and Eling (2011) contend that social cohesion (i.e., the closer link between ownership and control) could explain the efficiency gain of small firms. Furthermore, consistent with prior research (e.g., Abdul Kader et al., 2010; Mathewson, 1983), the observed link between profitability and the degree to which micro-life insurers have a diversified range of products suggests that compared with their counterparts with a narrow product-range, multi-product firms are better able to reduce the cost of risk in-house through 'natural diversification' as well as realize benefits from economies of scale and scope. In line with Biener and Eling (2011), the empirical results of the present study further reveals that micro-life insurers which have been operating in the micro-insurance market for longer period have lower annual profitability than newer market entrants. This result suggests that the innovative nature of new entrants, as well as the adaptation of new technology leads to a significant impact on profitability. Furthermore, consistent with the findings of prior studies (e.g., Doherty & Garven, 1995) the results of the present study suggest that for micro-life insurers in Nigeria and South Africa, profit margins reflect the average price of traded insurance policies which are inversely related to the movement of the average annual interest rates in the economy. On the other hand, no statistically significant support is obtained for the impact of the regulatory environment on the profitability of micro-life insurers in Nigeria and South Africa.

The fifth and final conclusion is that interesting results were obtained by conducting separate empirical analyses on the Nigeria and South Africa data set. Consistent with the results of the pooled data-set of Nigerian and South African micro-life insurers (see Table 6.4), and the findings of prior research (e.g., Choi & Weiss, 2005), the empirical results for the separate analysis of Nigeria and South African micro-life insurers reveal that cost efficient micro-life insurers are more profitable than less cost efficient firms. The results suggest that the success of the managers of micro-life insurance firms in controlling transaction costs is crucial for profitability. The empirical results

further show that the increasing use of leverage has a positive impact on the profitability of micro-life insurers in both Nigeria and South Africa. This result is consistent with the findings of prior research (e.g., Jensen, 1986; Harris & Raviv, 1990, 1991), and reveals the benefits of leverage in providing tax shield and mitigating agency conflicts. Furthermore, consistent with hypothesis H2c and the findings of prior research (e.g., Cummins & Sommer, 1996; He & Sommer, 2010) the empirical results reveal that Nigerian micro-life insurance firms with shareholding closely-held by management are likely to be more profitable suggesting that compared to the other stock ownership forms considered, the closer merger of the owner-manager functions in firms with stock closely-held by management plays a huge role in reducing the agency costs of monitoring and control. On the other hand, South African micro-life insurers with stock shareholdings closely held by institutional investors such as insurance and mutual firms are likely to have greater annual profitability. The result which is consistent with the findings of prior research (e.g., Shleifer & Vishny, 1986) suggests that compared to the other stock ownership forms considered in the present study, the lower marginal cost of acquiring and disseminating information for large non-management (institutional) investors results in the effective monitoring of the activities of managers. In addition, the underpinnings of the historical development of the insurance market in both Nigeria and South Africa could also be a possible explanation for the dominance, and subsequent profitability of these ownership forms (see chapter 2, section 2.2).

Finally, contrary to the findings of prior studies (e.g., Garven & Lamm-Tennant, 2003), the empirical results for the interaction between leverage and reinsurance results in a reduction in profitability for South African micro-life insurers. The results suggest that the high cost of reinsurance outweighs its potential benefits of alleviating the expected bankruptcy costs of high leverage, thus leading to a reduction of profitability. On the other hand, the empirical findings reveal no statistically significant support for the impact of the interaction between the leverage and reinsurance on the profitability of Nigerian micro-life insurers.

7.4 Contributions of the Research

The present study provides new and potentially important insights regarding the factors that drive the profitability of micro-life insurers in Nigeria and South Africa. It also examines the institutional and macroeconomic differences that could impact on the annual profitability of micro-life insurers. Therefore, the present study is considered to contribute to the existing literature in at least five main regards.

First, the inverse relation between the profitability of micro-life insurers and the amount of reinsurance purchased obtained using the pooled data-set of both Nigerian and South African micro-life insurers suggests that reinsurers may need to 'moderate and modify' their reinsurance prices in micro-insurance markets either as a CSR exercise or to expand the underwriting capacity and solvency position of micro-insurance carriers. In addition, reinsurers could, for example, offer micro-insurers 'conditional fixed-period cut price' reinsurance cover until such time that sufficient volumes of business have been generated to enable adequate underwriting data (e.g., experience rating) systems to be developed. Therefore, in highlighting that reinsurance has potential costs as well as risk transfer benefits; the present study could be relevant to local insurance industry regulators and others (e.g., credit ratings agencies) in their licensing and financial assessment of micro-life insurers. The research project could also help managers of micro-life insurance firms to better assess annual profitability, and make more accurate reinsurance decisions.

Second, the inverse relation between the firm size of micro-life insurance firms and annual profitability could suggest to industry regulators that small micro-insurers may be more sustainable (solvent) in developing countries than larger operatives. In addition, in showing that smaller operatives are more profitable, the research project could be of interest to multinational financial institutions and others (e.g., business consultants) to make more informed strategic decisions in emerging markets (e.g., with regard to prospective joint-ventures and acquisitions). The results could also be of

interest to policy-makers to encourage and support the growth of smaller micro-life insurance firms.

Third, Nigeria and South Africa provide interesting environments for the examination of the profitability of micro-life insurers, because although being the two largest economies in sub-Saharan Africa, both countries are characterised by a large proportion of low-income households who do not currently have access to formal risk mitigating mechanisms. Therefore, by providing insights into the factors that drive the effective supply (and profitability) of micro-life insurance, the present study could be of interest to policy-makers, and supervisory bodies in supporting the development of micro-insurance. In addition, the insights obtained from the research project could be employed in the understanding of micro-insurance operations, not only in sub-Saharan Africa but in other parts of the developing world that have similar social and economic characteristics such as Latin America and the Caribbean.

Fourth, the separate analysis of Nigerian and South African micro-life insurers yield interesting results. For the sample of Nigerian micro-life insurers examined, the empirical results reveal that younger, larger, cost-efficient firms which have stock closely held by management and employ increasing leverage are more profitable. On the other hand, the empirical results reveal that for South African micro-life insurers; smaller, cost efficient firms which have stock closely held by large institutional investors (e.g., insurance and financial institutions) employed increasing leverage, and purchased a lower amount of reinsurance are more profitable. The findings of the research project could provide useful insights for multinational investors and managers of micro-life insurance firms in Nigeria and South Africa in the assessment of the viability/profitability of their micro-insurance programs. In addition, the findings reveal that even in jurisdictions with similar economic characteristics such as Nigeria and South Africa, a one-size fits all approach in terms of investment opportunities is not always effective as the cultural and institutional differences of the micro-life insurer have to be carefully considered.

Fifth, the results of the two frontier estimation methods (i.e., DEA and SFA) employed in the computation of the cost efficiency estimates confirm the reliability and robustness of the empirical results. Therefore, in showing that the economic insights derived from using either econometric (SFA) or the linear programming (DEA) approaches are relatively similar, the present study contributes to the literature (and intense debate) on frontier efficiency estimation in the insurance industry. The research project could therefore be of interest to academics as well as practitioners in the insurance industry.

7.5 Research Limitations

The inferences drawn from the research findings should be interpreted by acknowledging the inherent limitations within the study. However, as far as possible, corrective actions have been taken to minimise the effects of such shortcomings. The key limitations of this research project are outlined below.

First, the present study focuses on the quantitative factors that drive the profitability of micro-life insurers. However, there may be other omitted country, firm and/or time invariant factors (e.g., customer trust, geographical location and cultural factors) which might also influence the profitability of micro-life insurers. Hence, the generalisation of the research findings has to be made with caution taking into account the potential impact of these other qualitative factors. However, the study employs a panel data design which has the advantage of controlling for the omission of country, firm and/or time-specific variables.

Second, the panel data design employed in the present study could produce potential sample bias. Specifically, the three-year consecutive data requirement for each insurer produces an unbalanced data sample arising from the new entry and exit of insurers into the micro-insurance market as a result of the consolidation exercise conducted in the Nigerian insurance industry in 2007. The unbalanced panel data sample could affect estimated regression estimates and the observed inferences. Nonetheless, panel data design enables the present study to observe the determinants of profitability

across insurers, as well as within an insurer over time which cannot be done using either cross-sectional or time series data.

Third, because of a relatively small number of firm-year observations, the present study was unable to employ other alternative estimation techniques such as the generalized Method of Moments (GMM) estimation which helps to control for potential econometric problems such as endogeneity (reverse causation) and unobserved firm and time-specific effects (e.g., variations in managerial talent) that could confound interpretation of results. However, the sample of micro-life insurers examined in the present study represents a comprehensive snapshot of the industry. In addition, the reported empirical results are robust and reliable as the robustness tests conducted (see chapter 6, section 6.6) did not reveal significant discrepancies in the computed coefficient estimates.

7.6 Areas for Future Research

Based on the empirical results and research limitations, there are several prospective areas for future research emanating from the present study.

First, the implications and insights arising from the analysis of the factors that influence the profitability of micro-life insurance firms could be extended to the non-life segment of the micro-insurance market. Indeed, the research implications could be employed in the analysis of profitability in other sectors of the micro-finance industry such as banks and credit unions.

Second, a further step for future research would be to expand the data-set in order to provide a better basis for the analysis of the profitability of micro-life insurance providers. For example, Mayers and Smith (1988) contend that mutual insurers (including friendly societies and co-operatives) are more able to control agency conflicts (and subsequent agency costs) due to the merger of the owner-policyholder functions, thus a larger set consisting of both stock and mutual firms would enable future research on the potential impact of different organisational forms on profitability. Furthermore, Biener and Eling (2011) find that offering group policies could help reduce the information

asymmetry problems that are widespread in micro-insurance markets. Therefore, using a broader data-set which captures the different types of micro-insurance policies offered, future research could examine the most appropriate policy-type or mechanisms for the control of information asymmetry problems (i.e., adverse selection and moral hazard). Finally, future research using a larger data set consisting of more countries or a single country with more micro-life insurers (e.g., India) could enable the refinement of the research methodology and estimation techniques.

Third, the empirical evidence obtained from the pooled data-set of Nigerian and South African micro-life insurers suggests that the increasing purchase of reinsurance results in a reduction of the profitability of micro-life insurers. However, due to data limitations, the study does not distinguish between the different types of reinsurance arrangements that result in maximum profitability. Therefore, future research which examines the impact of different types of reinsurance arrangements (e.g., proportional vs. non-proportional reinsurance) on the profitability of micro-life insurers could yield interesting insights.

Fourth, the use of innovative distribution methods (e.g., mobile phone network) have been shown to alleviate some of the issues associated with relatively high transaction costs in micro-insurance. Indeed, Swiss Re (2010) reports that the achievement of economies of scale through the identification and selection of a cost effective distribution model is crucial to the long-term success and sustainability of micro-insurance, given the high administrative and operating costs involved in micro-insurance markets. Thus, future research could examine the most appropriate and cost efficient distribution system for the effective supply and sustainability of micro-insurance.

Fifth, the empirical results in the present study reveal no significant relation between the regulatory environment and profitability of micro-life insurers. However, Koven and Zimmerman (2011) describe the ideal regulatory environment for micro-insurance as one which neither over-promotes the market nor creates barriers through the rigid enforcement of traditional guidelines, and contend that a supportive regulatory environment is crucial for the business success of micro-insurance. Therefore, future research could

expand the current study by employing alternative measures of regulation and/or eliciting the views of insurance industry participants as to the appropriate regulation for promoting micro-insurance business.

7.7 Final Remarks

The huge potential market for micro-insurance has captured the attention of local and multinational insurance and reinsurance firms, and multinational investors. However, despite its great market potential - estimated to be up to 2-3 billion policies globally with annual growth rates at 10% or higher - the penetration rates for micro-insurance are currently much lower than predicted. The long-term viability of many micro-insurance schemes currently in place particularly in developing countries is also being questioned. The extant literature on micro-insurance highlight the supply and demand factors affecting the penetration and viability of micro-life insurance. However, few studies have quantitatively examined the factors that drive the profitability of micro-life insurance firms. Drawing a framework from the micro-insurance and financial economics literature, the current study extends prior research by examining the determinants of the profitability of micro-life insurers in Nigeria and South Africa.

The present study employs the two main frontier efficiency estimation techniques (i.e., DEA and SFA) in the computation of the cost efficiency estimates in a first-stage analysis. This was followed by the use of the feasible generalised least squares (FGLS) panel data estimation design to empirically test the research hypotheses put forward in the fourth chapter. The FGLS estimation was employed as it helps to control for the simultaneous presence of heteroskedasticity and serial correlation in the sample data.

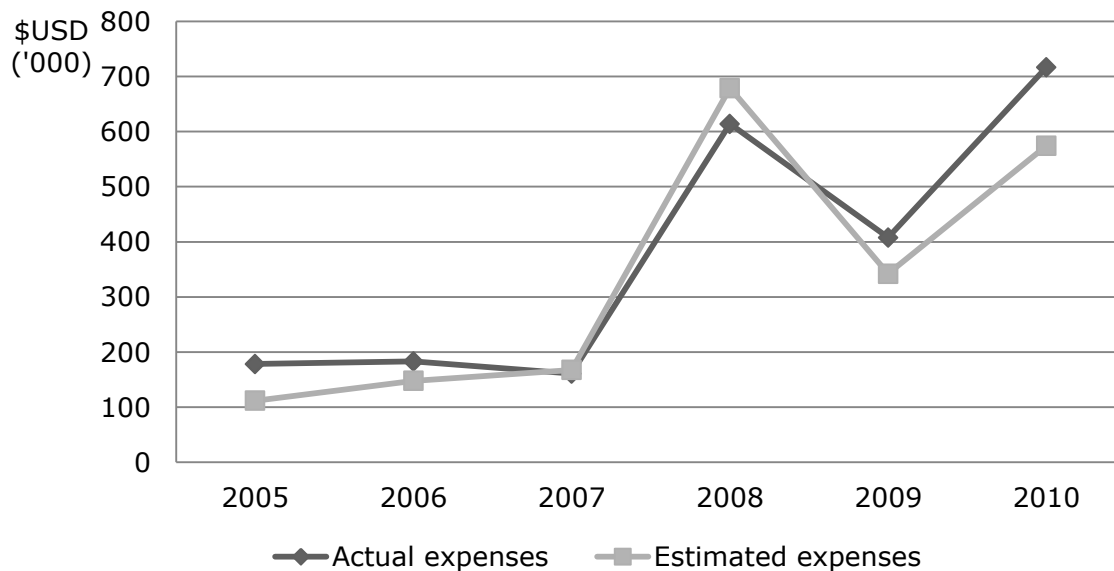
The empirical findings of the pooled data-set of Nigerian and South African micro-life insurers support some of the research hypotheses and the results of prior research but contradict others. In line with the results of prior research (e.g., Choi & Weiss, 2005; Greene & Segal, 2004), the empirical findings reveal that cost efficiency is a significant driver of the profitability of

micro-life insurers especially given the relatively low average annual profitability. The results further indicate that risk management decisions such as leverage and the purchase of reinsurance are significant drivers of profitability. Consistent with prior research (e.g., Jensen, 1986), the benefits of leverage in providing tax-shield benefits and mitigating agency-conflicts result in higher profitability for micro-life insurance firms. On the other hand, in line with the findings of prior studies (e.g., Jean-Baptiste & Santomero, 2000), the increasing purchase of reinsurance results in a reduction in profitability due to the costly nature of reinsurance for primary micro-life insurance providers. In addition, contrary to previous studies (e.g., Adams et al., 2008; Garven & Lamm-Tennant, 2003), the empirical findings for the interaction between leverage and reinsurance results in a negative impact on profitability, suggesting that the high costs of reinsurance outweighs the potential bankruptcy costs induced at high leverage. The present study finds no support for the relation between all the ownership structure variables considered and profitability. Furthermore, institutional differences such as firm size, product-mix, and age of the micro-life insurer were also found to be significant drivers of profitability. In addition, macro-economic indicators such as the average annual interest rates in the economy was found to be a significant driver of the profitability of micro-life insurers' while statistically significant support was found for the influence of the regulatory environment (Mayers, Shivdasani, & Smith 1997)

The present study contributes potentially valuable insights on the quantitative factors that drive the profitability of micro-life insurers in Nigeria and South Africa, and therefore makes an important contribution to the dearth of the literature on micro-insurance. Furthermore, the empirical results of the present study could be of interest to local and multinational insurance and reinsurance firms, industry regulators, and other stakeholders such as multinational investors and international aid agencies. Finally, the present study provides a useful basis for the conduct of future research on other factors surrounding the viability and effective supply of micro-insurance. For example, future research could focus on issues such as the determination of the most appropriate organisational forms for the control of information asymmetry, distribution mechanisms, and regulation.

Appendix A

Comparison of Actual vs. Estimated Expenses of Micro-Life Insurers in Nigeria, 2005-2010.



USD(\$'000)	2005	2006	2007	2008	2009	2010	Mean
Observed/Actual expenses	178.24	182.98	161.01	613.87	407.88	716.55	376.76
Estimated expenses	111.94	147.75	167.72	679.06	342.18	574.05	337.12
% Difference	37	19	-4	-11	16	20	11

Source: Research Data. This appendix presents the tabular and graphical analysis of the actual versus estimated expenses of eleven micro-life insurers in Nigeria. The actual expenses are the expenses for which actual micro-insurance data is available while the estimated expenses are those calculated using the proportional method of expense allocation – see chapter 5, section 5.2.

Appendix B

Definition and Descriptive Statistics of Inputs, Input Prices, and Outputs employed in the Estimation of Cost Efficiency.

Panel A : Definition of Inputs and Outputs

Variable	Proxy
Inputs	
<i>Labour and business service</i>	<i>Operating expenses/price of labour</i>
<i>Debt capital</i>	<i>Total liabilities</i>
<i>Equity capital</i>	<i>Capital plus surplus</i>
Input Prices	
<i>Price of labour</i>	<i>Regional ILO wage per year</i>
<i>Price of debt capital</i>	<i>Long-term government bond rates</i>
<i>Price of equity capital</i>	<i>5-year average of yearly total return rates of regional MSCI EM indices.</i>
Outputs	
<i>Premiums</i>	<i>Net Premiums</i>
<i>Investments</i>	<i>Investment income</i>

Panel B: Descriptive Statistics of Inputs, Outputs and Efficiency Estimates.

Variable	Unit	Mean	Std. Dev.	Min.	Max.
Inputs					
<i>Labour and business service</i>	Quantity	1329.29	2369.97	3.38	14035.05
<i>Debt capital</i>	\$million	125.31	243.69	0.16	762.24
<i>Equity capital</i>	\$million	10.02	15.77	0.12	50.73
Input prices					
<i>Price of labour</i>	\$	6338.74	4327.13	1816.79	14449.84
<i>Price of debt capital</i>	%	7.63	1.68	3.85	9.10
<i>Price of equity capital</i>	%	16.90	6.45	10.59	30.74
Outputs					
<i>Net premiums</i>	\$million	24.28	38.19	0.10	112.17
<i>Investment income</i>	\$million	8.20	17.04	0.001	54.15
<i>Operating expenses</i>	\$million	7.75	11.93	0.12	34.91
<i>Total costs</i>	\$million	7.93	11.91	0.21	35.02
Efficiency Estimates					
<i>DEA: Cost Efficiency</i>		0.31	0.29	0.01	1.00
<i>Technical Efficiency</i>		0.65	0.32	0.08	1.00
<i>Allocative Efficiency</i>		0.48	0.29	0.01	1.00
<i>SFA: Cost Efficiency</i>		0.79	0.09	0.17	0.94
<i>Technical Efficiency</i>		0.78	0.10	0.09	0.91
<i>Allocative Efficiency</i>		0.35	0.24	0.01	0.97

Source: Research Data. Following prior research (e.g., Cummins & Zi, 1998), to ensure direct comparability, all monetary values are deflated by the consumer price index to the base year 2005. Country-specific consumer price indices were obtained from the International Monetary Fund (2012) indices. The values were further converted into U.S dollars using the exchange rates available from the Thomson DataStream. Negative and /or zero values for input and output variables are transformed by adding a fixed number, following the translation invariance method of Pastor (1996).

Appendix C

Definition and Description of Dependent, Independent and Control Variables.

Variables	Definition and Description
Dependent Variable:	
Profitability (<i>Profit</i>)	<p>Following Wipf & Garand (2010), the annual profitability, <i>Profit</i> is the return on assets (ROA) which is measured as the ratio of net income before interest and taxes for insurer <i>i</i> in year <i>t</i> to the average of total assets in years <i>t</i> and <i>t</i> – 1. That is;</p> $\frac{NI}{TA} = \frac{EP_t + I_t - CL_t - \{+Co_t\}}{\frac{TA_t + TA_{t-1}}{2}}$ <p>where <i>t</i> denotes the <i>t</i>th -year, <i>NI</i> represents net income; <i>EP_t</i> represents premiums earned (net of reinsurance); <i>I_t</i> is investment income (net of fees); <i>CL_t</i> is incurred claims (net of reinsurance recoverable), <i>ME_t</i> is management expenses, <i>Co_t</i> is commissions paid, and <i>TA</i> is total assets.</p>
Independent Variables:	
Cost efficiency (<i>Efficiency</i>)	As in Greene and Segal (2004), this variable is measured as firm-specific cost efficiency estimates derived using the DEA and the SFA.
Ownership Structure (<i>Ownership</i>)	Consistent with He and Sommer (2010), ownership structure is represented by dummy variables for each share ownership class considered, namely: <i>D_p</i> = 1 for public (widely-held) stock micro-life insurer, and 0 for private (closely- held) stock micro-life insurer. For the variation of private (closely-held) stock micro-life insurers, <i>D_{pm}</i> =1 for shareholdings closely-held by management, 0 otherwise; <i>D_{pb}</i> = 1 for shareholdings closely-held by banks, and 0 otherwise; while <i>D_{po}</i> =1 for shareholdings closely-held by others (e.g., insurance companies, financial companies, and mutual funds), and =0 otherwise.
Leverage (<i>Leverage</i>)	Following Rajan and Zingales (1995), leverage is measured as the ratio of [net (of reinsurance) life insurance liabilities + other liabilities] and surplus.
Reinsurance (<i>Reinsurance</i>)	As in Adiel (1996), the quantity of reinsurance purchased by micro-life

	insurer i , in year t , is measured as the ratio of annual gross premiums ceded to total gross premiums written.
Control Variables:	
Regulatory Environment (<i>Regulation</i>)	As in Biener et al. (2013), regulation is measured as the country-specific annual percentile rank of the regulatory quality index compiled by the World Bank (2012). The index captures the perception of the ability of the government to formulate and implement sound policies and regulations that promote the development of the private sector. The percentile rank indicates the percentage of countries world-wide that rank lower than the indicated country. Thus, higher values reflect better regulation.
Firm size (<i>Size</i>)	Firm size is measured as the natural logarithm of annual total admitted assets. This approach alleviates the possible effects of extreme values confounding the empirical results (e.g., see Hardwick, 1997)
Product-mix (<i>Product-Mix</i>)	As in Mayers and Smith (1994), the product mix is measured by a Herfindahl concentration index that is computed using the three major lines of products sold by micro-life insurers: life insurance; credit life and funeral insurance. The Herfindahl index is computed for each firm as: $Product\ Mix = \sum_{l=1}^3 \left(\frac{Dpw_l}{Tpw} \right)^2$ where Dpw_l is the amount of direct premium written in the l^{th} line of insurance, and Tpw is the amount of total premiums written across micro-life insurance lines. The closer the Herfindahl index to one, the more concentrated is the production function of the micro-life insurer.
Length of time in the market (<i>Age</i>)	Following, Biener and Eling (2011), age is measured as the number of years a micro-life insurer has been operating in the market. The natural logarithm of the number of years (<i>lnAge</i>) is employed to alleviate the possible effects of extreme values which might confound the empirical results.
Interest rate (<i>Interest</i>)	This is measured as the country-specific average annual commercial bank lending rate (e.g., see Doherty & Garven, 1995).

Country-Effects (<i>Country</i>)	To control for country effects (e.g., cultural factors), a dummy variable <i>Country</i> is employed, where 1 represents Nigerian micro-life insurers, and 0 represents South African micro-life insurers.
Time-Effects	Dummy variables for each year (time effects) are employed to proxy for changes in unspecified macroeconomic factors, which are cross-sectionally constant (e.g., change in underwriting cycles, prices, inflation etc.)
Interaction-term (<i>Reinsurance x Leverage</i>)	Based on (Adams et al., 2008), an interaction term, <i>Reinsurance x Leverage</i> is included in the model to capture the possible interaction effects between corresponding variables. The centering procedure is applied in the computation of the interaction terms to prevent multicollinearity (e.g., see Coulton & Chow, 1993).

Appendix D

Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation- Using the Technical Efficiency Estimate.

	I. DEA				II. SFA			
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
<i>Intercept</i>	0.218	0.041***	0.236	0.037***	-0.528	0.046***	-0.535	0.042***
<i>Efficiency- Technical</i>	0.073	0.012***	0.069	0.013***	0.426	0.037***	0.428	0.038***
<i>Ownership: D_p</i>	-	-	-0.006	0.013	-	-	-0.003	0.012
<i>D_{pm}</i>	0.005	0.017	-	-	0.005	0.015	-	-
<i>D_{pb}</i>	0.015	0.014	-	-	0.003	0.014	-	-
<i>D_{po}</i>	0.002	0.022	-	-	0.007	0.021	-	-
<i>Leverage</i>	0.014	0.002***	0.014	0.002***	0.009	0.002***	0.009	0.002***
<i>Reinsurance</i>	-0.223	0.042***	-0.222	0.041**	-0.191	0.032***	-0.199	0.022***
<i>Regulation</i>	0.046	0.049	0.031	0.049	0.011	0.047	0.017	0.046
<i>Size</i>	-0.005	0.003*	-0.006	0.003*	-0.005	0.003	-0.005	0.003*
<i>Product Mix</i>	-0.076	0.026***	-0.099	0.025***	-0.059	0.024**	-0.060	0.021***
<i>InAge</i>	-0.019	0.008**	-0.024	0.008***	-0.015	0.009*	-0.016	0.008**
<i>Interest</i>	-0.439	0.283	-0.454	0.284	0.149	0.267	-0.187	0.254
<i>Reinsurance x Leverage</i>	-0.025	0.010***	-0.022	0.009**	-0.029	0.006***	-0.028	0.006***
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>Wald test</i>		192.50***		159.02***		241.68***		458.57***
<i>Obs.</i>		282		282		282		282

Source: Research Data. This table reports the results of the feasible generalised least squares (FGLS) regressions. The DEA column gives the results for the regressions in which the technical efficiency (*Efficiency-Technical*) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the technical efficiency (*Efficiency- Technical*) are derived using the stochastic frontier analysis. All other variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

Appendix E

Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation- Using the Allocative Efficiency Estimate.

	I. DEA				II. SFA			
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
<i>Intercept</i>	0.285	0.048***	0.273	0.041***	-0.156	0.040***	-0.169	0.032***
<i>Efficiency-Allocative</i>	-0.008	0.021	-0.006	0.014	0.187	0.019***	0.186	0.019***
<i>Ownership: D_p</i>	-	-	-0.016	0.014	-	-	-0.008	0.011
<i>D_{pm}</i>	0.003	0.018	-	-	0.023	0.014	-	-
<i>D_{pb}</i>	0.019	0.016	-	-	0.002	0.013	-	-
<i>D_{po}</i>	0.023	0.024	-	-	0.003	0.018	-	-
<i>Leverage</i>	0.015	0.002***	0.015	0.002***	0.012	0.002***	0.011	0.002***
<i>Reinsurance</i>	-0.222	0.042***	-0.212	0.037***	-0.174	0.034***	-0.179	0.029***
<i>Regulation</i>	0.017	0.053	0.028	0.052	0.083	0.045	0.759	0.043
<i>Size</i>	-0.008	0.003***	-0.009	0.003***	-0.026	0.003*	-0.003	0.002
<i>Product Mix</i>	-0.088	0.027***	-0.088	0.024***	-0.055	0.023**	-0.050	0.020**
<i>InAge</i>	-0.017	0.009*	-0.016	0.009*	-0.019	0.008**	-0.019	0.007**
<i>Interest</i>	-0.415	0.297	-0.427	0.291*	0.331	0.264	-0.350	0.253
<i>Reinsurance x Leverage</i>	-0.025	0.010***	-0.023	0.009**	-0.025	0.008***	-0.021	0.008***
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>Wald test</i>		101.77***		112.68***		247.06***		255.78***
<i>Obs.</i>		282		282		282		282

Source: Research Data. This table reports the results of the feasible generalised least squares (FGLS) regressions. The DEA column gives the results for the regressions in which the allocative efficiency (*Efficiency-Allocative*) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the allocative efficiency (*Efficiency-Allocative*) are derived using the stochastic frontier analysis. All remaining variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

Appendix F

Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Feasible Generalised Least Squares (FGLS) Estimation (Omitting the Regulation variable).

	I. DEA				II. SFA			
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
<i>Intercept</i>	0.236	0.043***	0.236	0.039***	-0.397	0.062***	-0.382	0.061***
<i>Efficiency</i>	0.078	0.018***	0.073	0.017***	0.741	0.055***	0.726	0.056***
<i>Ownership: D_p</i>	-	-	-0.014	0.013	-	-	-0.003	0.012
<i>D_{pm}</i>	0.003	0.017	-	-	0.015	0.012	-	-
<i>D_{pb}</i>	0.021	0.015	-	-	0.014	0.013	-	-
<i>D_{po}</i>	0.015	0.024	-	-	0.004	0.023	-	-
<i>Leverage</i>	0.017	0.002***	0.016	0.002***	0.013	0.002***	0.013	0.002***
<i>Reinsurance</i>	-0.218	0.042***	-0.208	0.041***	-0.167	0.033**	-0.169	0.033***
<i>Size</i>	-0.005	0.002***	-0.005	0.002***	-0.005	0.002***	-0.005	0.002***
<i>Product Mix</i>	-0.084	0.027***	-0.091	0.025***	-0.042	0.022**	-0.037	0.019*
<i>lnAge</i>	-0.022	0.009***	-0.023	0.008***	-0.017	0.008**	-0.019	0.007***
<i>Interest</i>	-0.531	0.289*	-0.567	0.291**	0.195	0.252	-0.202	0.254
<i>Reinsurance x Leverage</i>	-0.041	0.008***	-0.025	0.010***	-0.031	0.008***	-0.028	0.008***
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>Wald test</i>		150.88***		134.38***		357.26***		312.93***
<i>Obs.</i>		282		282		282		282

Source: Research Data. This table reports the results of the FGLS regressions. The DEA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the stochastic frontier analysis. The dependent variable is the annual profitability, *Profit* -the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t - 1$. All remaining variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

Appendix G

Analysis of the Profitability of Micro-Life Insurers in Nigeria & South Africa; 2005-2010: Pooled Ordinary Least Squares (OLS) Estimation.

	I. DEA				II. SFA			
	Coeff.	Robust Std. Error	Coeff.	Robust Std. Error	Coeff.	Robust Std. Error	Coeff.	Robust Std. Error
<i>Intercept</i>	0.293	0.068***	0.283	0.054***	-0.242	0.115**	-0.197	0.128***
<i>Efficiency</i>	0.056	0.035**	0.052	0.034*	0.627	0.129***	0.584	0.151***
<i>Ownership: D_p</i>	-	-	0.013	0.021	-	-	-0.003	0.019
<i>D_{pm}</i>	0.003	0.027	-	-	0.012	0.026	-	-
<i>D_{pb}</i>	-0.024	0.023	-	-	-0.014	0.022	-	-
<i>D_{po}</i>	0.001	0.034	-	-	0.030	0.036	-	-
<i>Leverage</i>	0.013	0.003**	0.013	0.003***	0.009	0.003***	0.010	0.003***
<i>Reinsurance</i>	-0.223	0.052***	-0.228	0.058***	-0.177	0.042***	-0.188	0.046***
<i>Regulation</i>	0.082	0.052	0.104	0.056*	0.114	0.051**	0.132	0.052**
<i>Size</i>	-0.012	0.004***	-0.013	0.003**	-0.013	0.004***	-0.014	0.003***
<i>Product Mix</i>	-0.124	0.045***	-0.121	0.042***	-0.110	0.049**	-0.113	0.046**
<i>lnAge</i>	-0.009	0.014	-0.008	0.013	-0.003	0.012	-0.004	0.012
<i>Interest</i>	-0.904	0.558	-0.875	0.556	-0.627	0.489	-0.647	0.482
<i>Reinsurance x Leverage</i>	-0.023	0.010**	-0.023	0.010**	-0.025	0.009***	-0.025	0.008***
<i>Time effects</i>		Yes		Yes		Yes		Yes
<i>F-statistics</i>		6.98***		7.43***		13.93***		14.08***
<i>R-square</i>		0.243		0.238		0.317		0.307
<i>Obs.</i>		284		284		284		284

Source: Research Data. This table reports the results of the pooled OLS. The DEA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the data envelopment analysis, while the SFA column gives the results for the regressions in which the cost efficiency (*Efficiency*) are derived using the stochastic frontier analysis. The dependent variable is the annual profitability, *Profit* -the return on assets (ROA) which measured as the ratio of net income to the average of total assets in years t and $t - 1$. All remaining variables are defined in Appendix B. ***, **, and * indicate the significance at the 0.01, 0.05, and 0.10 levels respectively.

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