

# **The Relationship between Access to Debt Finance and Viability of Small & Medium Enterprises in Zimbabwe**

A Dissertation

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by

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## **ABSTRACT**

The study examines the relationship between the level of access to debt finance and viability among 41 randomly selected SMEs operating in the agricultural sector in Zimbabwe for the period 2011 and 2014 using descriptive statistical analysis and panel data regression analysis. The study found that viability is positively associated with short-term debt and negatively associated with long-term debt, while it has no significant relationship with total debt. The study concludes that the level of debt accessed does not matter to viability; what matters is the type of debt accessed. It also concludes that access to debt is not the main factor associated with viability, but there are other factors such as size of business, growth opportunities, number of employees and the ratio of female to male shareholders. It is therefore recommended that SMEs managers and policy makers should be mindful of the type of debt availed to SMEs since short-term debt is positively related to viability and long-term debt is negatively associated with viability. It is also recommended that SME managers should monitor the sizes of their enterprises and growth opportunities since these are negatively associated with viability. Female ownership of SMEs should be encouraged and supported as the results demonstrate that those enterprises dominated by female shareholders are associated with high viability. SME managers should ensure that they have adequate employees, since the results show that viability is associated increasing the number of employees.

## TABLE OF CONTENTS

PLAGIARISM DECLARATION .....	i
ABSTRACT .....	ii
TABLE OF CONTENTS .....	iii
LIST OF TABLES .....	v
LIST OF FIGURES .....	v
GLOSSARY OF TERMS.....	vi
ACKNOWLEDGEMENT.....	vii
DEDICATIONS .....	viii
CHAPTER 1 .....	1
INTRODUCTION.....	1
1.0 Background.....	1
1.1 Research Area.....	3
1.2 Problem Statement.....	3
1.3 Purpose and Significance of the Research.....	4
1.4 Objectives .....	5
1.5 Research Questions .....	5
1.6 Research Concept and Scope.....	5
1.7 Summary of Chapter 1.....	5
CHAPTER TWO.....	6
LITERATURE REVIEW .....	6
2.0 Introduction .....	6
2.1 Definition of SMES .....	6
2.4 Theoretical Literature: Capital Structure Theories .....	7
2.4.1. Modigliani and Miller Theory .....	7
2.4.2. Agency Cost Theory.....	7
2.4.3. The Pecking Order Theory .....	7
2.4.4. The Trade-off theory .....	8
2.4.5. Empirical Literature.....	8
2.4.5.1. Related Empirical Literature on Zimbabwe .....	11
2.5. Summary of Chapter Two .....	12
CHAPTER THREE.....	13

RESEARCH METHODOLOGY .....	13
3.2 Research Approach and Strategy .....	13
3.3 Sampling.....	15
3.3.1. The Population.....	15
3.3.2. Sampling Techniques .....	15
3.3.3. Sample Size .....	16
3.4 Data Collection Techniques .....	16
3.5 Data Analysis.....	18
3.6 Summary .....	21
CHAPTER FOUR .....	22
RESEARCH FINDINGS, ANALYSIS AND DISCUSSION .....	22
4.1 Introduction .....	22
4.1 Profile of Businesses Surveyed .....	22
4.1.1 Years of Experience .....	22
4.1.2 Number of Employees.....	23
4.1.3 Loss/profit making status .....	23
4.2 Performance of Sampled Companies .....	26
4.3 Multiple Linear Regression Results .....	31
4.4 Summary .....	34
5. RESEARCH CONCLUSIONS AND RECOMMENDATIONS .....	35
5.0 Introduction .....	35
5.1 Conclusions and Recommendations.....	35
5.2 Limitations of Study .....	36
5.3 Recommendations for Further Research .....	36
REFERENCES .....	37
APPENDICES .....	41
Appendix 1: General Shareholder & Manager Profiles.....	41
Appendix 2: Debt to Asset Descriptive Statistics.....	41
Appendix 3: Average Data used in Descriptive Statistics .....	42
Appendix 3: Random Effects Models Estimated and Hausman Tests .....	43

## **LIST OF TABLES**

Table 1: Financial Characterization of Loss making firms .....	23
Table 2: General Characterization of Shareholders and Managers of Businesses .....	24
Table 3: Relationship between Ownership & Profitability.....	25
Table 4: Gender Composition of Business Shareholders .....	25
Table 5: Number of Managers who have received Business Training.....	26
Table 6: Proportion of Fulltime Employees .....	28
Table 7: Asset-Equity and ROE .....	28
Table 8: Debt to Asset Descriptive Statistics .....	29
Table 9: Correlation Matrix.....	30
Table 10: Random Effects Models coefficient estimates .....	32
Table 11: Effect size of variables .....	34

## **LIST OF FIGURES**

Figure 1: Most Problematic Factors for Doing Business in Zimbabwe .....	2
Figure 2: The Conceptual Framework.....	17
Figure 3: Summarized Number of Year of Operation Data .....	22
Figure 4: Summary of Firm size by number of Employees.....	23
Figure 5: Number of Shareholders per Business .....	24
Figure 6: Educational Qualifications of Business Managers.....	25
Figure 7: Overall Performance by Count .....	27
Figure 8: Return on Equity and Sales Growth over 3 years .....	27
Figure 9: Return on Labour .....	28

## **GLOSSARY OF TERMS**

ME	Micro entrepreneurs
MSEs	Micro and Small enterprises
MSMEs	Micro, small and medium sized enterprises/business
SMEs	Small and medium enterprises
SMEAZ	Small and Medium-sized Enterprises' Association of Zimbabwe
GDP	Gross Domestic Product
NBSSI	National Board for Small Scale Industries
GSS	Ghana Statistical Service
UNIDO	United Nations Industrial Development Organization
M&M	Modigliani and Miller
MoFED	Ministry of Finance & Economic Development
MSMECD	Ministry of Small and Medium Scale Enterprises and Cooperative Development

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## **DEDICATIONS**

I dedicate this thesis to my family – Rumbie, Dionelle, Devante, Jay and Jaheim. I love you.

And to all those who believed in me, I am humbled by your support.

# CHAPTER 1

## INTRODUCTION

### 1.0 Background

Small and Medium Enterprises (SMEs) play a significant role in the economy of a country. The performance of the SME sector is closely associated with the performance of the nation (Chittithaworn *et al*, 2011). They form the foundation of the local private sector and contribute the largest portion of the employment base in any developing country (Chowdhury, Azam and Islam, 2013). SMEs across the globe have been hailed for immense employment creation, Gross Domestic Product contribution, export earnings and the general well-being of the populace (Majoni, Matunhu and Chaderopa, 2016). A SMEs sector that is strong fosters resilience by broadening and diversifying the domestic economy, thereby reducing the vulnerability to sector-specific shocks (Mugozhi and Hlabiso, 2017). Small and medium enterprises (SMEs) are essential for the economic stability of the country, and they act like a cushion to economic shocks (Hyder and Lussier, 2016).

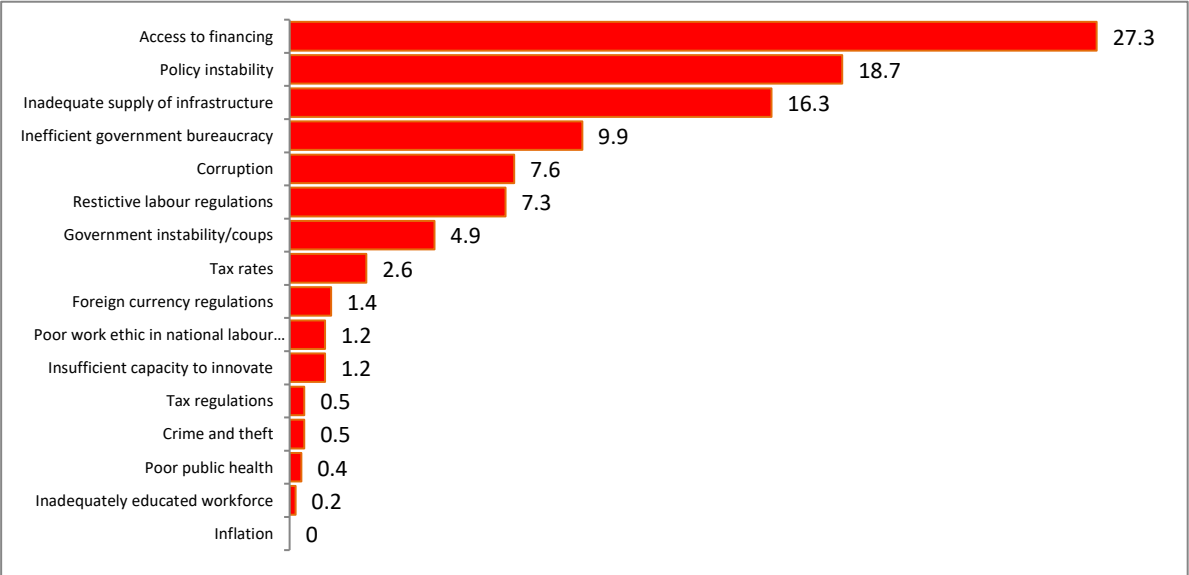
Internationally, SMEs account for about 50% of Gross Domestic Product (GDP) and 60% of employment (Chowdhury, Azam and Islam, 2013). Some of the world's well performing economies such as Taiwan, Hong Kong, Japan, South Korea, Malaysia and China are thriving on SMEs (Chowdhury, Azam and Islam, 2013; Majoni, Matunhu and Chaderopa, 2016). Japan has achieved its industrial development heavily based on SMEs (Chowdhury, Azam and Islam, 2013).

In Zimbabwe there are 2.8 million SMEs contributing over 60% to GDP and employing about 5.8 million people (FinMark Trust, 2012). According to the Government of Zimbabwe's National Budget Statement for 2013, SMEs employ more than 60% of the country's workforce and contribute about 50% of the country's GDP. However, SMEs in Zimbabwe contribute only 15% of the total formal employment (Katua, 2014). Most of the SMEs (43%) in Zimbabwe operate in the agriculture sector (Finscope Survey, 2013). The agricultural sector is considered as the mainstay of the economy, contributing about 12% to GDP, 60% of the feedstock to the manufacturing sector, 66% to total employment, and about 31% of foreign currency earnings in 2016 (Government of Zimbabwe, 2017; Government of Zimbabwe 2012; Reserve Bank of Zimbabwe, 2017).

According to the Government of Zimbabwe Mid-term National Budget Review of 2014, large companies mainly in the manufacturing sector have been folding their operations at a rate of 8 companies per month due to the economic meltdown of 2008, huge operating costs, aging equipment and prohibitive regulatory/operating environment. However, some have been able to survive several years on as they have continued to make profits year after year. The longer a company can stay profitable, the better is its viability. By definition<sup>1</sup>, viability is the ability to survive. In a business sense, that ability to survive is ultimately linked to financial performance and position. It is measured by the company’s long-term survival, and its ability to have sustainable profits over a period of time.

Zimbabwean SMEs have been demonstrating resilience to survive these economically challenging times (Matarirano, 2007). Notwithstanding, some SMEs have failed to stay afloat citing the overly stringent conditions associated with access to debt financing. According to the African Development Bank (2013) the top five most problematic factors affecting ease of doing business in Zimbabwe are: access to finance, policy instability, and inadequate supply of infrastructure, inefficient government bureaucracy and corruption (Figure 1).

**Figure 1: Most Problematic Factors for Doing Business in Zimbabwe**



Source: AfDB (2013: 4)

<sup>1</sup> <http://www.ato.gov.au/calculators-tand-tools/Business-viability-assessment-tool/>

In Figure 1 above, it is clear that access to finance is the main factor that impinges on the prosperity of businesses in Zimbabwe. According to Potter (2013), the reason behind financial constraints to growth for SMEs is that the provision of debt and equity finance is strongly affected by market failures, primarily information asymmetries, moral hazard, and adverse selection, which result in credit rationing as a rational screening strategy used by lenders to select reliable borrowers.

### **1.1 Research Area**

This study focuses on analysing the relationship between SMEs viability and access to debt financing in the agricultural sector in Zimbabwe. The SMEs studied are located in Harare which is the capital city of Zimbabwe. Harare is the main economic hub of Zimbabwe and as such many companies are headquartered in Harare. SMEs of interest are agro-processing firms who are active across various value chains.

### **1.2 Problem Statement**

SMEs are recognized as engines of economic growth worldwide (Chowdhury, Azam and Islam, 2013). However, SMEs in Zimbabwe fail to grow and develop into larger profitable enterprises despite their immense contribution to economic growth, employment creation and poverty alleviation (Majoni, Matunhu and Chaderopa, 2016; Matamanda and Chidoko, 2017). The failure rate of SMEs is high globally (Hyder and Lussier, 2016) and this leads to a waste of resources. The often cited major obstacle to SME viability, growth and development has been limited access to finance (Chowdhury, Azam and Islam, 2013; Mugozi and Hlabiso, 2017). Financing is the lifeblood of business enterprises and adequate financing allows SMEs to expand, compete with larger firms and create new markets for themselves (Matamanda and Chidoko, 2017).

However, in Zimbabwe the importance of access to finance on SMEs viability has often been based on opinions and perceptions of SME owners and managers. Such opinions and perceptions may be invalid empirically because the relationship between viability and access to debt finance is not clear cut; it can be either negative or positive or even non-existent (Al-Qudah, 2017). This therefore warrants the need for an empirical investigation to ascertain the nature of the relationship and help inform SME owners, managers and policy makers. Thus, the million dollar question that business leaders and entrepreneurs would be keen to answer to is: is debt finance a remedy or source of problems for SMEs?

Apart from access to debt finance, there are other factors that affect viability of SMEs. Factors such as business planning, proper employee staffing, adequate capital inflows, age of the SME, business related qualifications, entrepreneurial skills, the gender of the manager, and partnerships are important for the viability and success of SMEs (Hyder and Lussier, 2016; Tabouratzi, Lemonakis and Garefalakis, 2017; Majoni, Matunhu and Chaderopa, 2016; Mugozi and Hlabiso, 2017). Despite existence of these other factors, limited access to debt finance has been overemphasised as the main constraint of SMEs viability.

This study therefore seeks to empirically understand and ascertain the relationship between viability and access to debt finance among SMEs operating in the agricultural sector in Zimbabwe, as opposed to the reliance on opinion and perception surveys. It also seeks to empirically ascertain if indeed access to debt finance is the major factor affecting SMEs viability.

### **1.3 Purpose and Significance of the Research**

The purpose of the study is to empirically investigate the relationship between viability and access to debt among SMEs operating in the agricultural sector in Zimbabwe. This study is important in a number of ways. The study focuses on the agricultural sector which, not only has the largest share of SMEs (48%), but is also the mainstay of the economy in terms of GDP contribution, employment creation and linkages with other sectors. The study attempts to empirically ascertain the relationship between viability and access to debt rather than relying on subjective perception and opinion surveys as is the case with most studies conducted in Zimbabwe. The study also attempts to ascertain if really access to debt is the major driver of SMEs viability as often reported in most opinion and perception surveys. It also investigates the effects of the type of debt on viability. The results of the study will help SME owners and policy makers to make informed decision on the choice of debt and level of debt which is more associated with SMEs viability. The study will also highlight other factors that SME owners and policy makers will need to look at in order to enhance viability of SMEs.

## **1.4 Objectives**

The main objective of the study is to examine the relationship between SMEs viability and access to debt. The specific objectives are:

1. To examine the relationship between viability and the level of total debt accessed by SMEs
2. To examine the relationship between viability and the type of debt accessed by SMEs
3. To assess the relative importance of access to debt finance in explaining SMEs viability

## **1.5 Research Questions**

1. Is there a relationship between viability and access to debt finance by SMEs?
2. Is viability associated with the type of debt accessed?
3. Is access to debt financing the main factor affecting SMEs viability?

## **1.6 Research Concept and Scope**

There is no single theory that comprehensively covers all aspects of debt in relation to viability (Muscettola and Naccarrato, 2017). The relationship between viability and access to debt has been explained in theory using four main theoretical frameworks: pecking order theory, agency cost theory, trade-off theory and signalling theory (Al-Qudah, 2017). These frameworks will underpin the analysis in this study and they are discussed in detail in the literature review chapter.

## **1.7 Organization of the dissertation**

This chapter presented the background and introductory framework to the study. In addition, the chapter articulated the problem that the study seeks to solve and outlined the research questions. Further, the chapter presented the scope of the study, importance of the study and the conceptual framework that underpins the study. Chapter two reviews the relevant theoretical and empirical literature on the various research questions of this study. The chapter also presents a summary of the literature. Chapter three presents the research methodology and design used in the study including the population and sampling techniques, the research procedures, data collection and analysis. Chapter four presents and discusses the findings and results of the study while Chapter five presents conclusions and recommendations, as well as the limitations of the study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

Chapter two covers definitions of SMEs, and importance to access to finance for SMEs viability. It also includes discussions on the capital structure theories and how they relate to firm profitability. Review of empirical literature on the relationship between firm viability and debt will also be presented.

#### **2.1 Definition of SMES**

SMEs have been defined and used differently in various contexts and there is no single definition that can capture all the dimensions of a SME (Majoni, Matunhu and Chaderopa, 2016). There is no universal definition of SME but definitions in literature are mainly based on employment, turnover and asset base. Tappe (2009) defines SMEs using qualitative and quantitative criteria. The qualitative criteria include elements such as unity of ownership and management, central position and importance of entrepreneurship, and specific finance and organisational structure. The quantitative criteria include the number of employees, gross revenue and total assets.

In Zimbabwe, the Reserve Bank of Zimbabwe defines an SME as an enterprise characterised by an asset base of US\$10,000 to US\$2 million, an annual turnover of US\$30,000 to US\$5 million, and employment of 5 to 75 people (RBZ, 2013). The Small Enterprise Development Corporation (SEDCO) defines SME as a firm that has at most 100 employees and a maximum annual sales turnover of US\$830,000. In 2012 the SME Association of Zimbabwe defined a small enterprise as having a turnover of less than \$240 000 or assets less than \$100 000 and medium enterprise as having turnover and assets above the thresholds for small enterprises, but less than \$1 million. In legal terms, the Ministry of Small and Medium Enterprise and Cooperatives Development defines a small enterprise as a business operating as a registered entity, employing not more than 50 people while a medium enterprise as an enterprise employing up to 75 and 100 people. In this study SMEs being analysed are defined according to the definition used by the Ministry of Small and Medium Enterprise and Cooperatives Development.

The importance of discussing various SME definitions is to bring out the indicative financial need (capital intensity), expected turnover and the level of returns (revenue) the businesses are likely to realise. This relationship brings out the efficiency with which the firm is converting resources to profit. In principle, different size firm would have different financial needs in proportion to its size.

## **2.4 Theoretical Literature: Capital Structure Theories**

Capital structure by definition is the combination of debt and equity available for a firm's operations. Informing this research is a number of theories which have been advanced in explaining the capital structure of firms in relation to firm performance. The theories of capital structure that link debt and profitability are discussed below.

### **2.4.1. Modigliani and Miller Theory**

Modigliani and Miller (1963) asserted that tax benefits are influenced by the firm's capital structure through the interest "tax-shield" arising from debt financing. The interest "tax shield" refers to the reduction of tax payment due to the fact that interest paid on debt is deductible for tax purposes. Based on interest "tax shield", Modigliani and Miller (1963) implied that companies should borrow as much as possible in order to increase their after tax profits and maximize their value. Therefore this theory implies that there is a positive relationship between capital structure and debt finance.

### **2.4.2. Agency Cost Theory**

According to Jensen and Meckling (1976) agency costs in business arise from the separation of ownership and control and conflict of interest between managers and shareholders. As a result, debt is used as a disciplinary tool to ensure that managers give preference to wealth creation for equity holders. Therefore this theory assumes a positive relationship between debt and firm performance.

### **2.4.3. The Pecking Order Theory**

The pecking order theory was developed by Myers (1977). It suggests that there is no optimal capital structure and that firms have a preferred hierarchy for the financing decisions. The theory posits that firms usually prefer internal financing rather than external financing which is mainly

required when all internal funds are employed. This theory implies that there is a negative relationship between firm performance and debt, because higher profits can be used as internal finance therefore reducing the need for debt financing.

#### **2.4.4. The Trade-off theory**

The trade-off theory posits that the optimal capital structure is where the advantages and costs of using debt finance are in balance (Myers, 1984). Therefore organizations employ debt in order to benefit from tax-deductible interest payments (Modigliani and Miller, 1963). Since the target debt is where advantages and costs of debt are in balance, the trade-off theory suggests a positive relationship between capital structure and performance. However, during a financial crisis, the trade-off theory assumes a negative relationship between debt and performance, since increasing risk and shortage in capital lead to high cost of debt finance (Siddik, Kabiraj and Joghee, 2017). By the same argument, it can also be said that long-term debt is costly relative to short-term debt and therefore long-term debt is likely to be negatively related to viability. Long-term debt is relatively costly because of the increasing risk associated with the uncertainty arising from the lengthy tenure of long-term debt. Thus, the trade-off theory sheds some light on the effects of the type of debt on viability. Since this theory can separate the effects of type of debt on viability, it is more suitable for this study which also seeks to assess the relationship between viability and short-term and long-term debt. The other theories discussed above are silent of the distinctive effects of short-term and long-term debt on viability and therefore the trade-off theory is the ‘home’ for this study.

#### **2.4.5. Empirical Literature**

A number of studies have been conducted to investigate the relationship between debt and firm performance. Using panel data of 100 listed firms over the period 2006–2009 and exponential generalised least squares approach, Umar et al. (2012) found a significant positive association between the performance of a firm and capital structure in support of the trade-off theory. They used ROA, EPS and net profit margin as proxies to measure the performance and short-term debt obligations to total asset (STD), long-term debt obligations to total asset (LTD), and total debt obligations to total asset (TD) as the capital structure variables.

Salteh et al. (2012) examined the correlation between capital structure decisions on the profitability of 28 firms from the Tehran stock exchange over the period 2005–2009. They

found positive impacts of capital structure variables, STD, LTD, TD, on the performance proxies by ROE and Tobin's Q. On the other hand, Arbabiyan and Safari (2009), used panel data for 100 firms over the period 2001–2007, and reported a significant positive link of STD and TD with ROE. However, the authors observed an inverse association of LTD with ROE. The main drawback of this study was that they used only a single variable, ROE, to measure the performance. Al-Qudah (2017) examine the relationship between capital structure and financial performance in 48% of the firms listed in Abu Dhabi Securities Exchange over the period 2008-2015 and the results showed that there is positive relationship between the capital structure (debt ratio) and the profitability as measured by ROA.

While some studies have shown have shown a positive relationship between profitability and measures of debt, other studies have also shown a negative relationship. Siddik, Kabiraj and Joghee (2017) used pooled ordinary least square analysis to empirically examine the impacts of capital structure on the performance of 22 Bangladeshi banks over the period 2005–2014. They used return on equity (ROE), return on assets (ROA) and earnings per share (EPS) to measure performance. Their results showed that capital structure inversely affects bank performance. In a study which sought to explore the impacts of capital structure variables - TD, LTD and STD - on the performance of 72 Jordanian firms over the period 2005-2013 using pooled OLS, Ramadan and Ramadan (2015) observed a significant negative effect of capital structure on ROA.

Chandrapala and Knapkova (2013) used Fixed Effects model on a panel of Czech firms over the period 2004-2008 and the result showed a negative relationship between leverage and profitability. Vatavu (2014) analysed a sample of listed Romanian firms using GMM estimation over the period 2003-2012 and discovered a negative relationship between leverage and profitability. Darush and Peter (2015) analysed Swedish SMEs over the period 2009-2012 using Three-stage least squares (3SLS) and Fixed-Effects models, and found a negative relationship between profitability ratios and debt short-term debt and long-term debt. Chuke et al. (2016) examined a sample of Nigeria listed firms over the period 2001-2012 using Fixed Effects and Random Effects. They found that there is a negative and significant impact owing to limited long term debt. Nassar (2016) examined a sample of Industrial companies in Turkey 2005-2012, using Multivariate regression analysis and the result of this study was a negative significant relationship between capital structure and firm performance.

Abdel-Jalil (2014) employed multiple regression analysis and found that there is a significant inverse relationship between debt ratio and the proportion of debt to equity on the rate of return generated from investment activities (ROI). Hasan et al. (2014) examined the effects of capital structure choice on the performance of Bangladeshi firms over the period of 2007–2012, using ROA, ROE, EPS and Tobin's Q as the measures of performance. They used pooled ordinary least squares (OLS) regression and found negative association. Applying the log-linear regression model on the panel data of 141 Pakistani textile companies over the period of 2004–2009, Memon et al. (2012) discovered a significantly negative association between TD and ROA. Muritala (2012) used the TD as a single proxy of capital structure and ROA as a proxy to measure the performance of firms, analyzed the influence of using leverage in the capital structure on the performance of Nigerian firms over the period of 2006–2010. The results showed a negative influence of TD ratio on ROA. Similarly, Soumadi and Hayajneh (2012) reported a similar negative influence on ROE and Tobin's Q. However, Salimand and Yadav (2012) argued that a single measure is not enough to measure a firm's performance and employed EPS, ROA, ROE and Tobin's Q as measures of performance. Using panel data of 237 Malaysian companies over the period 1995–2011 found a significant negative influence of TD, LTD and STD on EPS, ROA, ROE and Tobin's Q.

In an analysis of 155 firms over the period 2002–2008, Manawaduge et al. (2011) showed that there is an inverse relationship between leverage and profitability of firms in Sri Lanka. Chakraborty (2010) also found a negative relationship between leverage and the performance of firms where performance was considered by the relative amount of profit before interest and taxes.

Other studies have also found that there is no significant relationship between profitability and debt. For example, Al-Taani (2013) examined the relationship between capital structure choice and profitability among Jordanian companies using over the period 2005–2009 and found no statistically significant association between ROA and debt ratio. Similarly, Ebaid (2009) found that capital structure decisions have weak or no impact on the performance of firms, using multiple regression analysis on panel data of 64 firms listed in the Egyptian capital market over the period 1997–2005.

To isolate the effects of capital structure on performance, Siddik, Kabiraj and Joghee (2017) used firm specific and macroeconomic variables as control variables. Specifically, they used

liquidity (LQTY), size (SZ) of bank, and growth opportunities (GOPP) as control variables. The more the liquid assets are, the lower the rate of return and therefore there is a negative relationship between profitability and liquidity. However, there is an ambiguous relationship between size and profitability (Siddik, Kabiraj and Joghee, 2017). The relationship can be positive due to efficiency derived from economies of scale (Flamini et al., 2009; Jahan (2012) and Rao and Lakew (2012)). It can also be negative due to inefficiencies arising from diseconomies of scale.

Soumadi and Hayajneh (2012) and Salim and Yadav (2012) observed a positive link between the growth opportunities and the firm performance and thus concluded that a growth opportunity is the key determinant of the firm performance. Siddik, Kabiraj and Joghee (2017) calculate growth opportunities by computing the difference between present year's assets and the preceding year's assets and then dividing the difference by assets of the previous year.

Siddik, Kabiraj and Joghee (2017) also used economic growth (RGDPG) and inflation rate (INFL) as control variables for the macroeconomic conditions. Trujillo-Ponce (2013) observed a significant positive link connecting the economic growth and profitability of banks. According to Flamini et al. (2009) firms consider the anticipated inflation and adjust their prices in a manner so that their revenue will be more than the cost and therefore will achieve higher profits. Trujillo-Ponce (2013) found that there is a positive correlation between inflation and ROA of banks. However, Sufian and Habibullah (2009) found a negative association between profitability and inflation.

Hyder and Lussier (2016) applied the Lussier Model of business success and failure with a sample of 143 small businesses in Pakistan to better understand the reasons of their success or failure using logistic regression statistical analysis. Their results indicate that business planning, proper employee staffing, adequate capital inflows and partnerships are important for the viability and success of small businesses in Pakistan.

#### **2.4.5.1. Related Empirical Literature on Zimbabwe**

Notable relevant empirical literature on Zimbabwean SMEs is scant and mainly focuses on factors that influence the success or failure of SMEs. Mugozhi and Hlabiso (2017) explored factors that determine SMEs success or failure through a case study of SMEs funded by Non-

Governmental Organisations (NGOs) in Zimbabwe using a descriptive statistical approach. Their findings showed that mentorship and close monitoring and evaluation were the key driving success factors and that viability was adversely influenced by three factors namely difficulty in securing loans, lack of training opportunities and shortage of entrepreneurial skills. Majoni, Matunhu and Chaderopa (2016) used a comparative study to examine the policies and challenges of SMEs operating in Zimbabwe and South Korea. They find that SMEs in the two countries face similar major challenges and what differs is that the Zimbabwean operating policy environment is less supportive of SMEs.

Matamanda and Chidoko (2017) evaluated the barriers faced by SMEs in accessing financing from banks. They noted that the biggest barriers to SME financing are lack of collateral, a small equity base and information asymmetry. Gudyanga and Gondo (2017) used a descriptive research design to analyse financial accounting challenges facing youth projects. Their findings are that the real challenges affecting financial accounting among youth projects include organizational culture, inadequate resources to buy gadgets and conduct quality audits, lack of technical knowledge on accounting and poor revenue generation.

## **2.5. Summary of Chapter Two**

A number of theories attempt to explain the relationship between debt and firm viability. These theories offer different accounts on how debt and viability are related, with the Modigliani and Miller theory and agency cost theory projecting a positive relationship, while the pecking order theory projects a negative theory. The trade-off theory projects a positive or negative relationship between viability and debt depending on the cost of debt. Since the other theories seem silent on the distinctive impacts of short-term and long-term debt on viability, the trade-off theory is chosen as the 'home' of the study since it sheds light of the distinctive effects of short-term and long-term debt on viability. The empirical literature reviewed basically showed that the relationship between firm performance and debt is either positive or negative or even insignificant depending on the context in which the study is made and the methodology used. Chapter three enlightens on the research methodology of the study, it defines the research design, population and sample size together with the description of data collection and analysis techniques used to carry out the study.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This section elaborates on the research methodology employed in this study. The choice of the methodology is informed by the nature of the dataset, the study objectives and the literature reviewed. Specifically, the section looks at the research approach and strategy, sampling technique, data collection techniques, conceptual framework and data analysis.

#### **3.2 Research Approach and Strategy**

To investigate the relationship between viability and access to debt and address the objectives of the study, a blended research approach combining descriptive statistical and econometric analysis is used. The study also uses a case study approach with 41 SMEs that applied for and accessed credit at two financial institutions in Zimbabwe in Harare over the period 2012 - 2014. Due to the panel data nature of dataset used in the study, panel data econometric regression techniques are used to determine the size, direction and significance of the relationship between viability and access to debt. To control for the effects of other variables on viability, the model estimated includes both firm-specific and macroeconomic variables that potentially influence viability.

The study estimates both Fixed Effects and Random Effects models and uses the Hausman diagnostic test to determine the most appropriate model. The Fixed Effects model assumes that time-invariant explanatory variables (e.g. gender, race and ethnicity) are correlated with time-variant explanatory variables. Its advantage is that it controls for time-invariant explanatory variables (measurable or immeasurable) so that the estimated effects of time-variant explanatory variables are unbiased. However, the disadvantage of the Fixed Effects model is that even if it controls for the time-invariant variables, it cannot give their estimated effects on the dependent variable. Therefore, the Fixed effects model would not be appropriate in instances where it desirable to estimate the effects of the time-invariant variables. The Fixed Effects model also does not control for omitted time-variant explanatory variables.

However, the Random Effects model assumes that there is no correlation between the time-invariant variables and the time-variant explanatory variables. The lack of correlation may be because there are no omitted time-invariant variables or because the omitted variables are not

correlated with the time-variant explanatory variables. Under such circumstances, the Random Effects model can give unbiased estimates of both time-variant and time-invariant explanatory variables, with smaller standard errors. It is appropriate if there is reason to believe that differences across entities (heterogeneity) have some influence on the dependent variable. The Random Effects model allows the generalisation of results beyond the sample.

In the case of this study, the Random effects models would ideally achieve the objectives of the model. It is more reasonable to expect that the SMEs in the study are different (heterogeneity) and these differences affect their performance. In the study, it is also important to estimate the effect of time-invariant variables rather than only controlling for them. It would also be ideal to generalise the results beyond the sample. Therefore, the use of the random effects model is ideal. Nevertheless, the Random effects model, just as the Fixed Effects model, has its own pitfalls. Therefore, an objective way of choosing between the two models is conducting the Hausman test.

The study also employs model diagnostic tests to ensure that the model is valid and appropriate before interpretation of the results. These include tests for time-fixed effects, Breusch-Pagan Lagrange Multiplier (LM) test for panel effects and heteroscedasticity tests. However, since the study employs a micro panel dataset (panel data with few years), other diagnostic tests that are associated with macro panel datasets (panel data with many years) are not performed. These include the Breusch-Pagan LM for cross-sectional independence, Parasan CD test for cross-sectional dependence, and stationarity tests.

In order to determine the importance of independent variables' association with viability, the study calculates and compares the effect size of each independent variable. The independent variables considered for effect size calculation are those which would be significantly associated viability in Equations 3 to 6 depicted in Section 3.5. The effect sizes offer a measure of practical importance in terms of the magnitude/importance of an effect and they are independent from sample size and dimensionless (Selya et al, 2012). Cohen's  $f^2$  is used to measure effect sizes of individual independent variables in this study. It helps to answer the question: which variables in a regression model are more related to the dependent and which ones are less related to the dependent variable? According to Selya et al (2012), Cohen's  $f^2$  measure of local effect size is appropriate for measuring local effect size in regression models

with hierarchical and repeated-measures data such as panel data regression models. The formula use for Cohen's  $f^2$  measure of local effect size is as follows.

$$f^2 = \frac{R_{AB}^2 - R_A^2}{1 - R_{AB}^2} \quad \text{Equation 1}$$

$f^2$  is Cohen's  $f^2$  measure of local effect size and  $R_{AB}^2$  is the proportion of variation in the dependent variable that is explained by a combination of two sets of variables  $A$  and  $B$ , where  $A$  is the set of all variables excluding  $B$  which denotes a set of variables or a single variable of interest (i.e. a variable whose explanatory power is being tested).  $R_A^2$  is the proportion of variation in the dependent variable which is explained by all other variables excluding the variable of interest. Therefore,  $R_{AB}^2 - R_A^2$  is the proportion of variation in the dependent variable which is uniquely accounted for by  $B$  the variable of interest, over and above all the other variables. According to Cohen (1988),  $f^2 \geq 0.02$ ,  $f^2 \geq 0.15$  and  $f^2 \geq 0.35$  represent small, medium and large effect sizes, respectively.

### **3.3 Sampling**

#### **3.3.1. The Population**

To be considered for this research a company had to be incorporated and currently trading and contributing to Zimbabwe's agricultural industry. There are over 190 companies found in the agribusiness portfolio or database that are participating in various high value crops, agro-processing and agro-service sectors. Services include land tillage, commodity brokerage and advisory services/consultancy. However, not all of these firms have complete financial records for the target period. In order to have workable homogenous data, a sample of competent SMEs, with complete financial records was drawn from this population.

#### **3.3.2. Sampling Techniques**

The simple random sampling technique was applied to a list of companies (sampling frame) that fall within the SMEs category who conducted business with a certain commercial bank (Barclays Bank). However, given the data protection and confidentiality concerns associated with accessing the data without consent from the sampling units, company names were replaced by Identification Numbers from 1 to 195. The numbered samples were then selected in a random manner before respective variables were extracted from the loan database and official financial reports where possible.

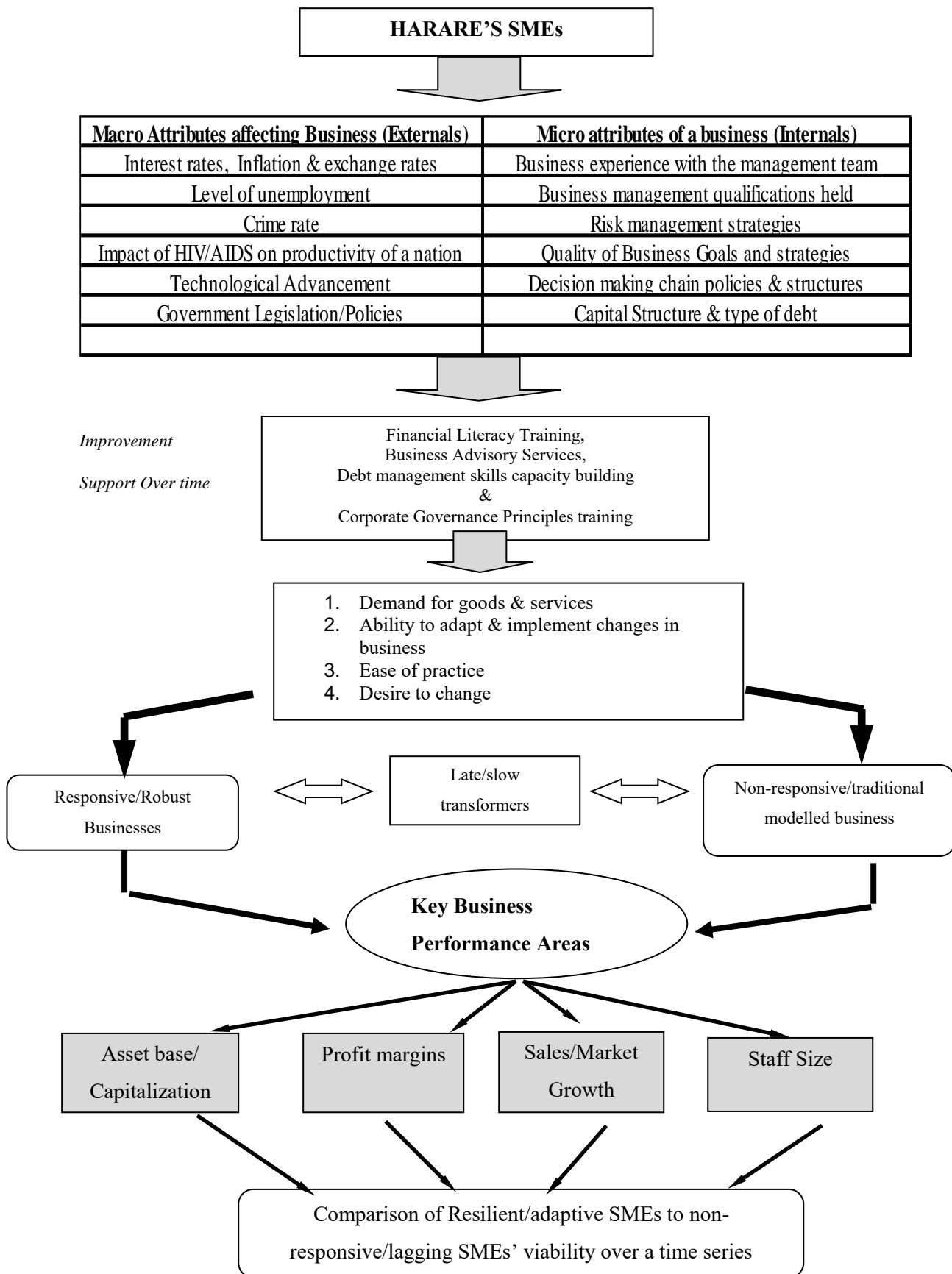
### **3.3.3. Sample Size**

Initially 65 samples were drawn; of which twenty-one (21) of these had some data missing and three (3) firms had stopped to operate towards the end of the sampling time period. Considered samples had to have financial data available for the target time period of at least the last 4 years, spanning from 2011 to 2014. Therefore, a sample of 41 SMEs was considered for analysis. The sampled firms were either in the agricultural industry or sourced part of their raw materials from any one of the agricultural sub sectors.

### **3.4 Data Collection Techniques**

Secondary data was used in the study. The firm-specific data was collected from Quest Microfinance and Barclays Bank recent loan application databases and official financial statements of the respective SMEs. Quest Microfinance is a registered Zimbabwean microfinance institution. The data collected covers 41 SMEs over the period 2011-2014. Macroeconomic data was collected from Zimbabwe National Statistics Agency. The dataset used had all observations for each SMEs for each and every year. Therefore, the study utilized a balanced panel dataset.

**Figure 2: The Conceptual Framework**



Source: Author's own analysis (November 2016)

### 3.5 Data Analysis

Descriptive summary statistics are used to make a preliminary analysis of the data to profile the SMEs being studied and understand their nature in terms of their years of experience, employment creation and financial performance. Graphs and charts are used to portray existing relationships between the variables characterising the SMEs. With cross sectional time series data on firms, the most commonly estimated models are probably Fixed Effects and Random Effects models (Williams, 2016). The generic model estimated in this study is as follows:

$$y_{it} = \mu_t + \beta x_{it} + \gamma z_i + \alpha_i + \varepsilon_{it} \quad \text{Equation 2}$$

$y_{it}$  is the dependent variable which can vary across time and SMEs.  $\mu_t$  is an intercept term that varies across time periods but remains constant across SMEs.  $x_{it}$  represents independent explanatory variables whose values can vary across time and SMEs and they are called time-variant explanatory variables. The  $z_i$  are the independent explanatory variables that do not vary across time and as such they are called time-invariant variables that measures stable characteristics such as race, gender and ethnicity. The  $\beta$  and  $\gamma$  are the coefficients of time-variant and time-invariant variables, respectively. They are assumed to be constant across time and SMEs.  $\alpha_i$  and  $\varepsilon_{it}$  are error terms, the former varies across SMEs only while the later varies across both time and SMEs.  $\alpha_i$  can be thought to be capturing all time-invariant variables that have not been included in the model.

A Fixed Effects model or a Random Effects model can be estimated depending on the assumption made about the correlation between  $\alpha_i$  and  $x_{it}$ . A Fixed Effects model assumes that these are correlated, maybe because there are some unobserved time-invariant or stable variables such as organisational culture, location, gender of manager and number of shareholders that are omitted from the model which explain  $y_{it}$ . While the Fixed Effects model controls for unobserved time-invariant variables and gives unbiased estimates, it cannot actually provide estimates of the impact that the time-invariant variables have on the dependent variable (i.e. the  $\gamma$ ). On the other hand, if  $\alpha_i$  and  $x_{it}$  are correlated, maybe because no time-invariant variables are omitted, or because the variables that are omitted are not correlated with the variables that are in the model, the Random Effects model can provide unbiased estimates of both the  $\beta$ s and the  $\gamma$ s, and will generally have lower standard errors than a Fixed Effects model.

The selection of variables used in the study is based on the research objectives and variables identified in both theoretical and empirical literature review. The study uses most of the variables identified and leaves out those which could not be accessed from the available records of SMEs studied. The specific models used in the study are based on the research objectives and reviewed theoretical and empirical literature. The models and variable definition and measurement are specified as follows:

$$lroe_{it} = \mu_t + \beta_1 lstd_{it} + \beta_2 lltd_{it} + \beta_3 lsz_{it} + \beta_4 lgopp_{it} + \beta_5 lwkrs_{it} + \beta_6 lexpe_{it} + \beta_7 lrgdpg_t + \beta_8 linfl_t + \gamma_1 Busi_i + \gamma_2 FTMR_i + \gamma_3 lnosh_1 + \varepsilon_{it} \quad (\text{Equation 3})$$

$$lroa_{it} = \mu_t + \beta_1 lstd_{it} + \beta_2 lltd_{it} + \beta_3 lsz_{it} + \beta_4 lgopp_{it} + \beta_5 lwkrs_{it} + \beta_6 lexpe_{it} + \beta_7 lrgdpg_t + \beta_8 linfl_t + \gamma_1 Busi_i + \gamma_2 FTMR_i + \gamma_3 lnosh_1 + \varepsilon_{it} \quad (\text{Equation 4})$$

$$lroe_{it} = \mu_t + \beta_1 logtd_{it} + \beta_2 lsz_{it} + \beta_3 lgopp_{it} + \beta_4 lwkrs_{it} + \beta_5 lexpe_{it} + \beta_6 lrgdpg_t + \beta_7 linfl_t + \gamma_1 Busi_i + \gamma_2 FTMR_i + \gamma_3 lnosh_1 + \varepsilon_{it} \quad (\text{Equation 5})$$

$$lroa_{it} = \mu_t + \beta_1 logtd_{it} + \beta_2 lsz_{it} + \beta_3 lgopp_{it} + \beta_4 lwkrs_{it} + \beta_5 lexpe_{it} + \beta_6 lrgdpg_t + \beta_7 linfl_t + \gamma_1 Busi_i + \gamma_2 FTMR_i + \gamma_3 lnosh_1 + \varepsilon_{it} \quad (\text{Equation 6})$$

*lroe* and *lroa* are measures of profitability used to proxy viability. Eton et al (2017) assert that profitability is the greatest indicator of performance for SMEs because it captures the aspect of ability to survive, the aspect of credit worthiness and the aspect of solvability of SMEs. Profitability measures help in assessing the success of a business undertaking and it has been widely used in empirical literature. *lroe* and *lroa* are ROE and ROA respectively. ROE is measured as the ratio of earnings before interest and taxes (EBIT) to total capital. ROA is measured as the ratio of EBIT to total capital. ROA provides a good indication on how efficient the business' management has been at using its assets for income generation. The Ratio can also be called ROI (Return on Investment). The metric is used to measure Investment efficiency of a business.

*lstd*, *lltd* and *logtd* are leverage measures used to proxy access to debt. In line with Pham (2017) and Osano and Languitone (2016) the study defines access to debt as the ratio of debt to total capital stock of the enterprise. Since this ratio is normalized by the size of the SME, it is therefore suitable for measuring ability to access debt. The access to debt measures used in the study are in line with the objectives of the study and previous empirical studies reviewed and are defined as follows:

- *lstd* is short term debt to total capital (%) computed as current liabilities divided by total capital expressed as a percentage.
- *lltd* is long term debt to total capital (%) calculated as fixed liabilities that are payable over more than a year, expressed as a percentage of total capital.
- *logtd* is total debt to total capital (%) computed as the sum of short and long term liabilities expressed as a percentage of total capital.

*lgopp* is the percentage growth of total assets and measures business opportunities available to the SMEs and it is expected to have a positive relationship with viability.

*lsz* is the size of SME as measured by the total assets. It can either be positively or negatively correlated to viability as a result of economies and diseconomies of scale.

*Busi* is a dummy variable indicating whether or not the manager of the SME has taken a business course. It takes values of 1 if manager has taken a business course and 0 otherwise.

*FTMR* is the dummy variable taking values of 1 if the proportion of females in the management of an SME is greater than that of man, and 0 otherwise.

*lexpe* is the number of years an SME has been in operation. It is expected that the more the number of years a business has been in operation, the more it is viable or profitable.

*lrgdpg* is the annual percentage growth of real GDP. It is a variable which controls the business operating environment. It is expected that a business is more profitable in a booming economy and less in an economy experiencing a recession.

*linfl* is the annual inflation rate and it is used as a control variable for macroeconomic conditions (Siddik, Kabiraj and Joghee, 2017).

The variables used in the study were transformed into logarithms except for categorical variables. The log transformation helps to improve the symmetry of distribution which is in line with the assumption that the variables in the models are approximately normally distributed.

### **3.6 Summary**

This chapter looked at the research methodology to be used in the study drawing from literature review and the need to address the objectives of the study. Descriptive statistical analysis and panel data regression models using Fixed Effects and Random Effects models were discussed in the chapter. Also discussed was the random sampling technique and the number of SMEs sampled. The conceptual framework and data analysis methods were also discussed.

## CHAPTER FOUR

### RESEARCH FINDINGS AND DISCUSSION

#### 4.1 Introduction

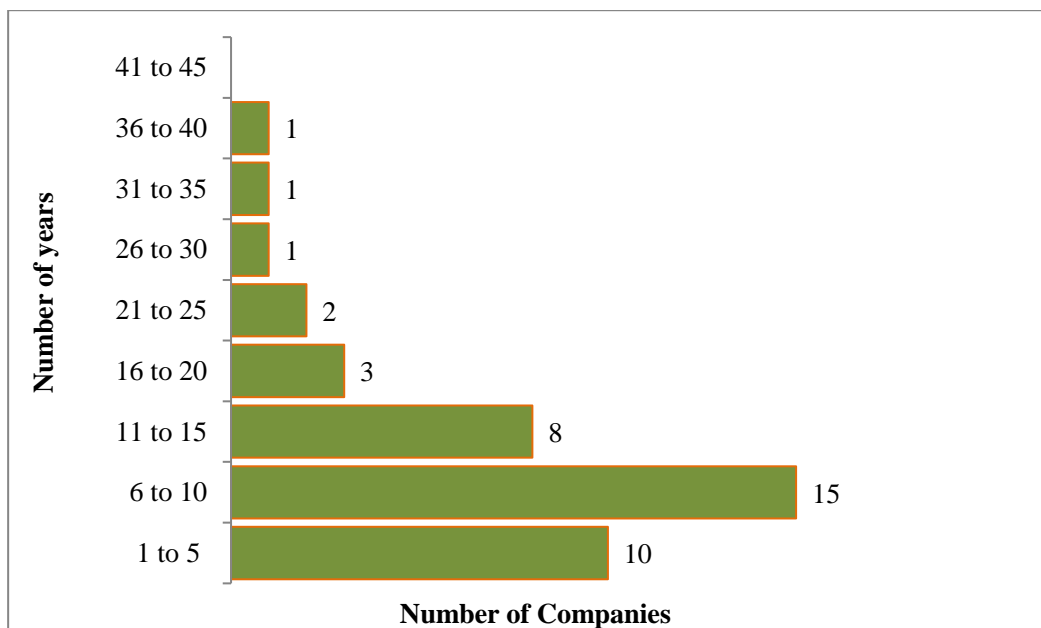
This chapter presents the discussions of the research findings. It covers the profile of sample businesses surveyed, descriptive statistic and the regression results on the relationship between debt and profitability.

#### 4.1 Profile of Businesses Surveyed

##### 4.1.1 Years of Experience

The majority of businesses have been operating for more than five years (Figure 3). Given the economic volatility experienced in the country over the last twenty years, there is no doubt that most of these firms have adapted and re-adapted their business model in order to survive. The modal class is 6-10 years of business experience with a score of 15 firms. The average number of years in business is 11.1 years. The youngest business has been in operation for 3 years while the oldest has been in existence for 37 years.

**Figure 3: Summarized Number of Year of Operation Data**



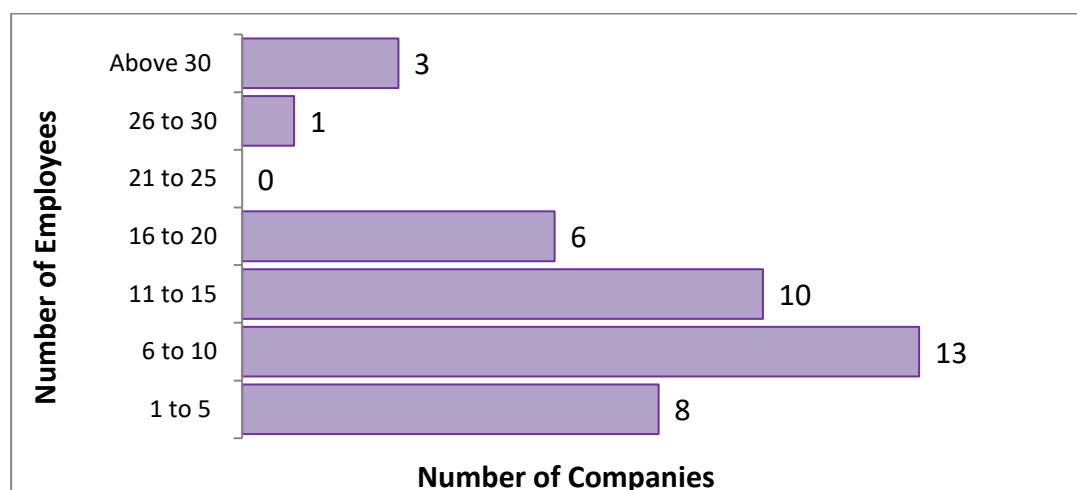
Source: Author's own analysis (November 2016)

#### 4.1.2 Number of Employees

The World Bank’s RPED classification of SMEs considers an SME with 0-5 employees to be a Micro enterprise, 6-29 employees to be a Small enterprise, 30-99 employees to be Medium enterprise and at least 100 employees to be a Large enterprise. According to this classification the SMEs studied can be classified as:

- 8 firms are micro in size
- 3 Companies are Medium-sized,
- 30 are Small enterprises.

**Figure 4: Summary of Firm size by number of Employees**



Source: Author’s own analysis (November 2016)

#### 4.1.3 Loss/profit making status

Table 1 below, gives a detailed characterization of loss making SMEs. There are four loss making SMEs in the samples studied

**Table 1: Financial Characterization of Loss making firms**

Firm ID	Years in Business	Av Staff size	Av. Short Term Debt (\$)	Av. Long term Debt	Av. Total Sales (\$)	Growth in Sales	Av. Net Profit (\$)	Av. Return On Equity
8	30	5	613435	0	613435	15%	-206392	-0.0469
31	6	7	125341	129666.7	255008	9%	-91256	-0.11858
38	6	10	26300	0	26300	-1%	-740.667	0.001283
39	13	18	14333	0	14333.33	20%	-20406	-0.00975

Source: Author’s own analysis (November 2016)

All the loss making companies are carrying short term debts and have an average Return on Equity of less than 10%. This potentially demonstrates that firm owners are realizing little or no profit from their investments. It appears long term debt has no influence on the company's profit making ability. Table 2 below, displays the non-financial attributes of the loss making companies analyzed.

**Table 2: General Characterization of Shareholders and Managers of Businesses**

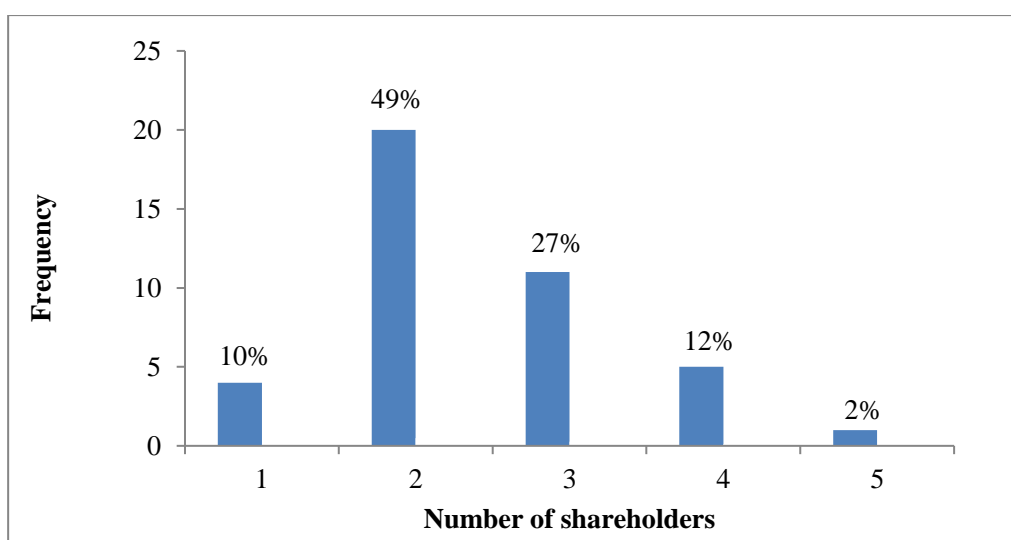
Firm ID	Number of Shareholders	Gender of Shareholders	Years in Business	Educational Qualifications of Managers	Has taken Business Management courses?	Av. Growth in Sales	Av. Net Profit (\$)	Av. Return On Equity
8	2	1M, 1F	30	Masters	N	15%	-206392	-0.0469
31	2	2M	6	High school	Y	9%	-91256	-0.11858
38	3	1M, 2F	6	Degree	Y	-1%	-740.667	0.001283
39	2	1M, 1F	13	Masters	Y	20%	-20406	-0.00975

Source: Author's own analysis (November 2016)

From the summaries given above (Table 2), the higher the number of shareholders the more likely it is for an entity to make profits. Educational or business qualifications held by management do not seem to influence the business' viability.

According to Figure 5 below, almost half of the SMEs comprise of two shareholders – a male and a female. Companies with only one or two shareholders tend to be loss makers than those with more shareholders.

**Figure 5: Number of Shareholders per Business**



Source: Author's own analysis (November 2016)

To further breakdown the relationship between shareholding structure (or size) and performance, Table 3 below provides profitability summaries by shareholding.

**Table 3: Relationship between Ownership & Profitability**

# of Shareholders	Average ROE (%)	Average EBITDA (\$)
1	13	231,990.00
2	32	269,303.00
3	41	283,429.00
4	23	269,303.00
5	8	1,423,803.00

Source: Author's own analysis (November 2016)

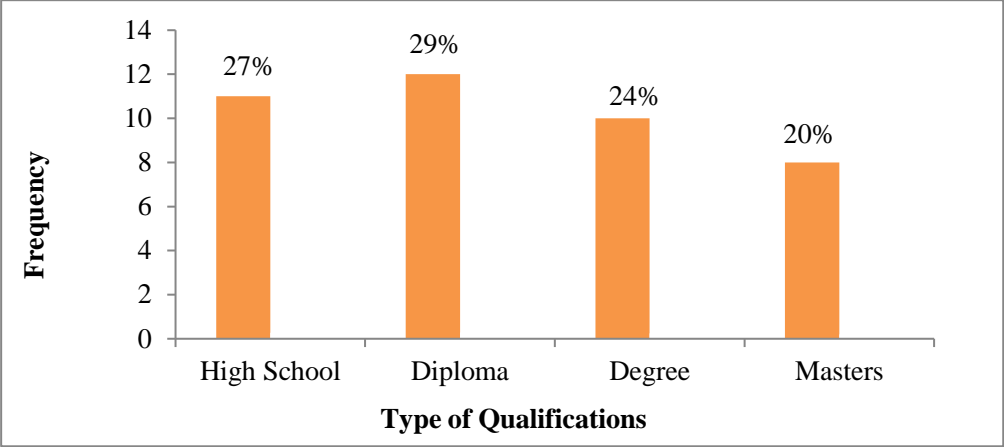
According to table 6 below, there are slightly more male shareholders than there are female. However, what is interesting is that only 4 firms have male ownership while 6 are female owned, with 31 firms having a mixed gender representation. Enterprise profitability tends to rise with the number of shareholders the business have.

**Table 4: Gender Composition of Business Shareholders**

Gender	Frequency	Valid Percentage
Male	56	55%
Female	46	45%
Total	102	100%

Source: Author's own analysis (November 2016)

**Figure 6: Educational Qualifications of Business Managers**



Source: Author’s own analysis (November 2016)

In Figure 6 above, educational qualifications held by managers do not seem to significantly influence the financial performance of the companies. The least four performing firms have managers who hold a diploma, a degree, a masters and a high school certificate each.

**Table 5: Number of Managers who have received Business Training**

Taken a Business course?	Frequency	Valid Percentage
Yes	27	66%
No	14	34%
<b>Total</b>	<b>41</b>	<b>100%</b>

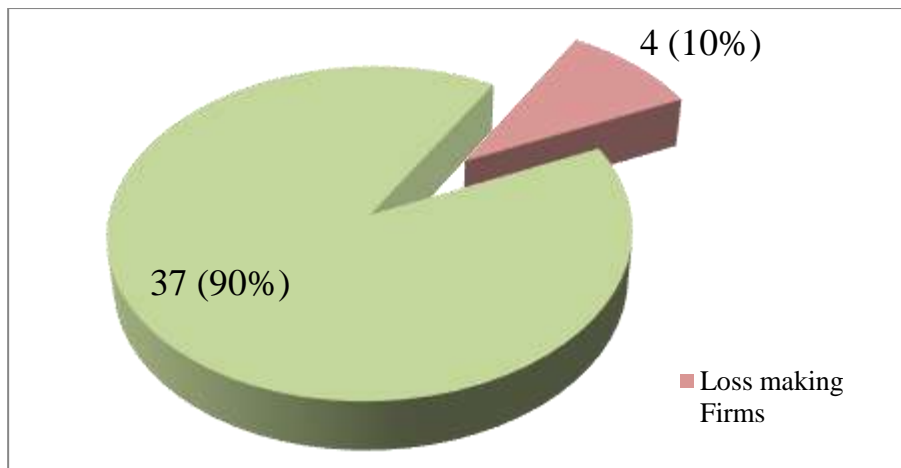
Source: Author’s own analysis (November 2016)

The average ROE for managers who have taken a business course is 37%, while for managers who have not taken any courses in business management sits at 19%. There is a potential link between profitability and having received business skills training. This indicates that with managers having taken a business course they are then more likely to make greater profit margins.

**4.2 Performance of Sampled Companies**

This section focuses on describing trends of characteristics linked to the efficiency with which the SMEs converts working capital or invested funds into output and income.

**Figure 7: Overall Performance by Count**

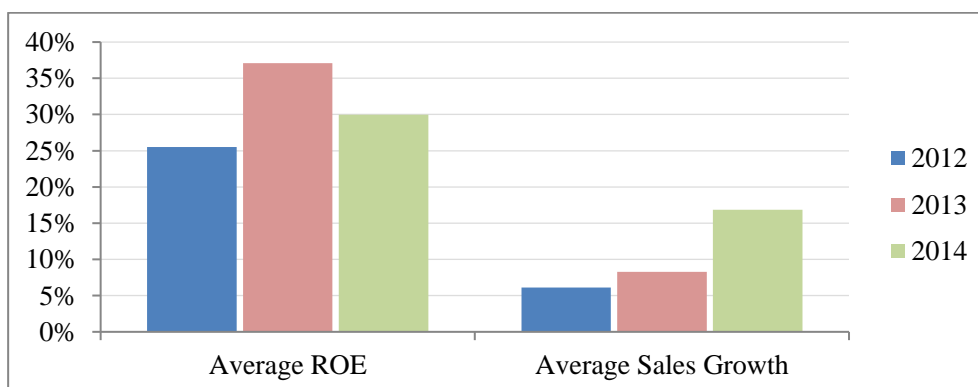


Source: Author's own analysis (November 2016)

Of the 41 companies only 10% has registered an aggregate loss in the last 3 financial years. In principle despite the chronic downturn in the economy there have been a number of resilient SMEs which have emerged or survived the difficult operating economic environment facing SMEs in Harare.

In Figure 8, while year-on-year sales growth maintained an increment trend, return on equity (ROE) actually took a slight slump in 2014.

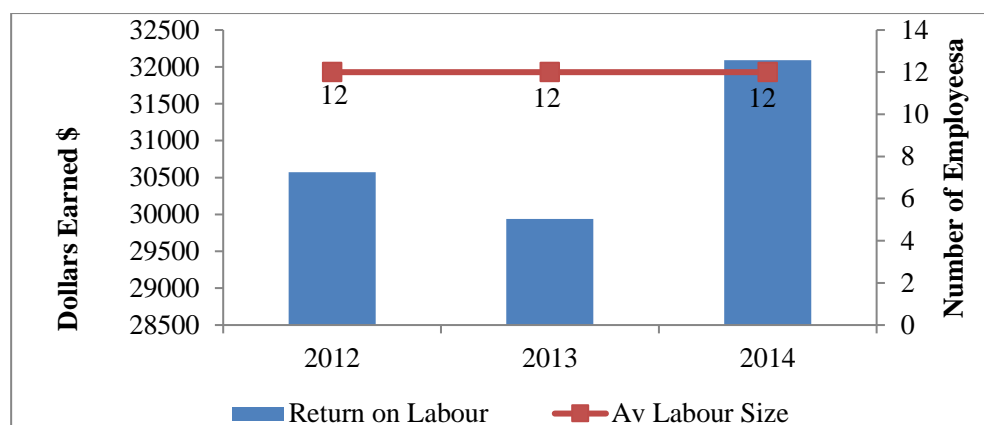
**Figure 8: Return on Equity and Sales Growth over 3 years**



Source: Author's own analysis (November 2016)

In the chart below (Figure 9) most profit (EBITD) was generated per employee in 2014. Across the 3 years the average staff size was at 12 employees.

**Figure 9: Return on Labour**



Source: Author's own analysis (November 2016)

**Table 6: Proportion of Fulltime Employees**

	2012		2013		2014	
<b>0-25%</b>	3	7%	3	7%	6	15%
<b>26-50%</b>	17	41%	16	39%	16	39%
<b>51-75%</b>	8	20%	14	34%	11	27%
<b>76-100%</b>	14	34%	8	20%	8	20%
<b>Yearly Average</b>		<b>61%</b>		<b>56%</b>		<b>52%</b>

Source: Author's own analysis (November 2016)

With reference to Table 6 above, from 2012 to 2014 the average composition of fulltime employees has gone down from an annual average of 61% to 52% respectively. Over the three years, the majority of firms have 26-50% of staff as permanents. However, the general decline in the number of fulltime employees may be attributed to the tough economic conditions that are currently prevailing in the country.

**Table 7: Asset-Equity and ROE**

	2012	2013	2014
<b>Asset/Equity Ratio</b>	1.31	1.31	1.28
<b>ROE</b>	25%	37%	30%

Source: Author's own analysis (November 2017)

The other source of finance is equity. From Table 7, the asset to equity ratio is between 1.29 and 1.31. This shows a general decline in the proportion of equity for businesses. As the proportion of equity declines the value of return on equity (ROE) shows a rise and fall trend. Given the short-term repayment structure associated with debt, businesses tend to have less cash flow crunches when they do not borrow and instead look to shareholders for funding.

**Table 8: Debt to Asset Descriptive Statistics**

	Expe	Busi	FTMR	NOSH	STD	LTD	TD	GROWTH	INFL	RGDPG	SZ	GOPP	ROE	ROA
<b>Mean</b>	12.14634	0.658537	0.292683	2.585366	11.81971	2.324548	14.14426	10.40751	1.717137	6.3	3666120	24.68632	30.84994	18.04751
<b>Standard Error</b>	0.741802	0.042932	0.041193	0.095847	1.982192	0.794527	2.114885	4.386768	0.145654	0.276492	369257.4	12.43612	6.455989	4.389294
<b>Median</b>	9	1	0	2	3.357416	0	5.181112	6.028544	1.637389	4.5	2220136	6.453239	12.70361	9.994578
<b>Mode</b>	6	1	0	2	0	0	0	#N/A	3.726165	10.6	760500	#N/A	#N/A	#N/A
<b>Standard Deviation</b>	8.226988	0.47614	0.456855	1.06299	21.98358	8.811731	23.45521	48.65161	1.615376	3.06645	4095263	137.9233	71.60038	48.67963
<b>Sample Variance</b>	67.68333	0.226709	0.208717	1.129948	483.2776	77.6466	550.1467	2366.98	2.609439	9.403115	1.68E+13	19022.83	5126.614	2369.706
<b>Kurtosis</b>	2.192633	-1.56752	-1.1681	1.330807	8.178138	32.03207	5.598209	35.43249	-1.5124	-1.5124	5.051427	108.4346	23.47496	56.07404
<b>Skewness</b>	1.612728	-0.67693	0.922585	1.021436	2.8432	5.277025	2.413187	4.512415	0.075153	0.687762	2.076578	10.14708	4.502117	7.032463
<b>Range</b>	36	1	1	5	119.7771	69.01261	119.7771	496.0358	3.938307	6.8	20921307	1562.981	572.2114	462.8743
<b>Minimum</b>	3	0	0	1	0	0	0	-92.2974	-0.21214	3.8	109427	-67.1852	-78.7025	-11.7498
<b>Maximum</b>	39	1	1	6	119.7771	69.01261	119.7771	403.7385	3.726165	10.6	21030734	1495.796	493.5089	451.1245
<b>Count</b>	123	123	123	123	123	123	123	123	123	123	123	123	123	123

**Source: Author's own analysis (November 2017)**

### Mean

Table 8 above, reports on the summary statistics for the 41 SMEs used in the study. Using the mean STD (Short term debt to total assets), LTD (Long term debt to total assets) and TD (Total debt to total assets) as measures for the level of indebtedness, the respective means of 12%, 2% and 14% show that manufacturing and agricultural companies in Harare were largely financed by short term debts. 14% TD shows that the majority of firms were not high gearing (not heavily indebted). This means that other forms of financing other than debt we relied upon. These alternative financing instruments can either be equity or grants for well-wishers and NGOs.

The average business management experience, in the any of the 41firms is 9 years. 65% of the SME's management teams have undertaken business management courses. However, the number of companies that has more females in management than males is at 29%. Companies have an average shareholding of 2.585. Inflation over the three year period, is averaged at 172% which may also be influencing the way the firms are doing business. A mean ROE of 31% which is marginally higher than the current lending rates which range between 7-25% per annum reflect in general that firms are able to pay back loans. A mean SME Size is \$3,67million. An RGDPG value of 6.3% indicates that agricultural SMES are contributing less than 10% of the country's GDP growth.

## Standard Deviation

The standard deviation value of the Growth on assets (GOPP) which is 137%, indicates that firms are experiencing widely varying rates of business growth. While for some firms there are huge business opportunities for growth, for others performance is depressed. But a ROE standard deviation of 71% indicates that the level of returns were wide ranging. In simple language we had one firm earn very high returns whilst another is making losses.

## Correlations

Table 9, shows that using the Pearson Matrix only short term Debt to Assets (STD) is strongly correlated to Total Debt to Asset (TD), and accounts for 92% of Total debt. There is a negative correlation of -19% between taking a business management course and business experience. This means that with greater experience management is less likely to take business courses. The relationship between experience and number of shareholders is a positive 32.7%, the more the business experience, the larger the number of shareholders in the business. However, although weak there was a positive correlation between TD and LTD, LTD and NOSH, STD and taking business management courses. There is a weak negative relationship between firm size and total debt; and NOSH and having more females in management than males; as well as firm size and ROE. Respectively, the smaller the firm the more likely they would have huge short term debt; and companies with a larger number of shareholders are less likely to have more females than males in management; and small companies tend to realize higher ROE.

**Table 9: Correlation Matrix**

	<i>Expe</i>	<i>Busi</i>	<i>FTMR</i>	<i>NOSH</i>	<i>STD</i>	<i>LTD</i>	<i>TD</i>	<i>GROWTH</i>	<i>INFL</i>	<i>RGDPG</i>	<i>SZ</i>	<i>GOPP</i>	<i>ROE</i>
<b>Busi</b>	-0.1943	1.0000											
<b>FTMR</b>	-0.0507	-0.1020	1.0000										
<b>NOSH</b>	0.3275	-0.3306	-0.1025	1.0000									
<b>STD</b>	-0.1753	0.1103	-0.0417	-0.0280	1.0000								
<b>LTD</b>	0.0216	-0.1710	0.0517	0.1201	-0.0278	1.0000							
<b>TD</b>	-0.1562	0.0391	-0.0196	0.0189	0.9268	0.3496	1.0000						
<b>GROWTH</b>	-0.0072	-0.0484	-0.1206	-0.0168	-0.0448	-0.0417	-0.0577	1.0000					
<b>INFL</b>	-0.0996	0.0000	0.0000	0.0000	0.0446	-0.0181	0.0350	-0.0892	1.0000				
<b>RGDPG</b>	-0.0906	0.0000	0.0000	0.0000	0.0163	-0.0424	-0.0006	-0.0692	0.9231	1.0000			
<b>SZ</b>	0.5599	-0.2150	-0.0110	0.3571	-0.1078	-0.0692	-0.1271	0.0736	-0.0712	-0.0614	1.0000		
<b>GOPP</b>	0.1241	-0.1378	-0.0907	0.1184	-0.0047	0.1016	0.0337	0.0289	-0.1326	-0.1048	0.1559	1.0000	
<b>ROE</b>	-0.0877	0.1245	0.1767	0.0392	0.0794	-0.1316	0.0250	-0.0267	-0.0277	-0.0490	-0.1593	-0.0670	1.0000
<b>ROA</b>	-0.0749	0.0537	0.2015	0.1089	-0.0449	-0.0402	-0.0572	-0.0066	0.0146	-0.0057	-0.1437	-0.0680	0.7436

Source: Author's own analysis (November 2017)

Consequently, in order to assess which type of debt (short or long term) has greater impact on ROE the regression models are in section 3.5 are estimated.

### 4.3 Multiple Linear Regression Results

The panel data regression models explained in Section 3.5 were estimated using both fixed effects and random effects models. The Hausman test was used to decide on the better models to be used to address the objectives of the study. The results showed that the random effects models had coefficient estimates that were not systematically different from those of the fixed effects models. Therefore, it was concluded that the coefficient estimates from the random effects models were not biased and could be used since they have lower standard errors compared to fixed effects models. They also provide parameter estimates for both time-variant and time-invariant variables. However, on the models that sought to establish the relationship between viability as measured by ROE and total debt, both random and fixed effects models were statistically invalid as shown by the small values of Wald  $\chi^2$  statistic and the F statistic, respectively. These statistics test for the joint significance of the coefficients in the model. These results of the estimated models and their diagnostic tests are shown in Appendix 3.

The results of the chosen Random Effects models are depicted in Table 10 in line with Equations 3 to 6 discussed in Section 3.5. Equation 3 shows the coefficient estimates for the random effects model relating ROE to STD and LTD as well as other variables. Equation 4 shows the relationship between ROA and STD and LTD as well as other variables. Equation 5 on the other hand shows the relationship between ROE and TD while Equation 6 shows the relationship between ROA and TD.

**Table 10: Random Effects Models coefficient estimates**

	Equation 3	Equation 4	Equation 5	Equation 6
Variable	ROE	ROA	ROE	ROA
Constant	-8.4534	-14.0335	-11.6256	-14.9288
LSTD	.3726**	0.1393*		
LLTD	-1.5551****	-0.3185**		
LOGTD			-0.0579	0.0224
LSZ	-0.0907**	-.1490****	-0.0622	-0.1307****
LGOPP	-0.0925	-.0997***	-0.1132	-0.1082***
LWKRS	0.2774	.6219*	0.1412	0.5337
LEXPE	0.0119	0.7195	-0.3028	0.5549
LNOSH	5.9512	3.9927	5.6691	4.0748
BUSI	0.0609	0.0063	0.1085	0.0192
FTMR	0.2002**	.1237*	0.1765	0.1164*
LRGDPG	0.5992	-0.1889	0.7261	-0.2017
LINFL	-2.4604	-0.3796	-2.3512	-0.2475
Wald chi test	42.57	85.67	12.93	70.89
Prob > chi	0.0000	0.0000	0.2277	0.0000
R-squared: overall	0.3012	0.2984	0.1717	0.3036
N	123	123	123	123

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01; \*\*\*\* p<0.001

The results show that short-term debt (lstd) has a statistically significant positive relationship with ROE and ROA at 5% and 10% significance level respectively. A 1% increase in lstd is associated with a 0.37% increase in ROE and 0.14% increase in ROA. These results are consistent with the theory of Modigliani and Miller (1963) which posits that the tax shield from debt reduces taxable income and hence increase profit and therefore firms would want increase debt and enjoy the tax shield. The result is also consistent with the trade-off and agency cost theories discussed in the literature review. Previous empirical studies that have found a positive relationship between viability and access to debt include Salteh et al (2012) and Umar et al (2012).

The results also show that long-term debt (lltd) has a statistically significant negative relationship with ROE and ROA at less than 1% and 5% level of significance respectively. As lltd increases by 1%, ROE would decline by 1.56% and ROA by 0.32%. The result is confirms the pecking order theory that holds that there is a negative association between profitability and debt because firms prefer internal sources of funding compared to external sources, hence an increase in profitability would imply a reduction in the need for external debt financing. Previous empirical studies that have found a negative association between viability and access to debt include Arbabiyan and Safari (2009), Chandrapala and Knapkova (2013), Ramadan and Ramadan (2015) and Siddik, Kabiraj and Joghee (2017).

However, the results show that there is no statistically significant relationship between total debt (logtd) and viability as measured by ROA. The potential reason behind this statistically insignificant result is that total debt is mainly driven by short-term debt, yet the link between short-term debt and ROA is weaker or only marginally significant compared to that of long-term debt and ROA. As a result, combining long-term debt and short-term debt weakens the overall relationship. Other studies that have not found significant relationship between debt and viability include Al-Taani (2013) and Ebaid (2009).

The results also show that there are other factors that have a statistically significant relationship with viability. The number of employees (lwkr) and the ratio of female shareholders to male shareholders (FTMR) positively correlate with firm viability. A 1% increase in the ratio of female to male shareholders would be associated with a 0.2% increase in ROE and 0.1% increase in ROA. A 1% increase in the number of workers would be associated with an increase of 0.62% in ROA. However, increases in the size of the firm are associated with decreases in viability. A 1% increase in the size of the firm is associated with a 0.1% decline in ROE and between 0.13% and 0.15% decline in ROA. Similarly, a 1% increase in growth opportunities is associated with a 0.1% decrease in ROE and between 0.1% and 0.12% decline in ROA.

To gauge the relative importance of the variables that are significantly related with viability, the study looks at the effect size of these variables as discussed in Section 3.2. Effect size, as measured by Cohen's  $f^2$ , shows the magnitude of the relationship between viability and individual explanatory variables, and therefore shows the relative importance of the explanatory variables. The results show that the effect size of STD ranges from no effect to small effect across the equations estimated (Table 11). Similarly, LTD has effect sizes that range from no effect to small effect. The size of SME (lsz) has effect sizes ranging from small to medium, while growth opportunities (lgopp), number of employees (lwkr) and FTMR have small effect sizes.

Looking at the  $f^2$ -statistic for each variable across the estimated equations, the variables' importance is as follows: size of SME, long-term debt, female to male ratio in SME ownership, growth opportunities, short-term debt and number of workers. Among the variables studied, long-term debt is the second important variable while short-term debt is the fifth important variable.

**Table 11: Effect size of variables**

Rank*	Dependent Variable	Independent Variable	Effect Size	Interpretation of effect size	Equation number
1	ROA	lsz	0.235	medium	6
1	ROA	lsz	0.232	medium	4
1	ROE	lsz	0.062	small	3
2	ROE	lltd	0.142	small	3
2	ROA	lltd	0.001	no effect	4
3	ROE	FTMR	0.089	small	3
3	ROA	FTMR	0.083	small	4
3	ROA	FTMR	0.079	small	6
4	ROA	lgopp	0.050	small	6
4	ROA	lgopp	0.044	small	4
4	ROE	lgopp	0.025	small	3
5	ROE	lstd	0.034	small	3
5	ROA	lstd	0.011	no effect	4
6	ROA	lwks	0.024	small	4

\* The variables are ranked according to their largest  $f^2$ -statistic appearing in any of the equations (3), (4) and (6) in Table 10. A variable takes the first position if in any of the models (3), (4) and (6) the variable has the highest  $f^2$ -statistic signifying the importance of its association with viability. Thus a variable takes the first position (Rank 1) if it has the largest  $f^2$ -statistic in any of the models, and the last position (Rank 6) if its largest  $f^2$ -statistic is the lowest compared to the largest  $f^2$ -statistics of the other variables.

#### 4.4 Summary

This chapter reviewed analysis results of the research which speak to the set out objectives. The chapter established that there is a positive significant correlation between short-term debt and viability. There is a negative statistically significant relationship between long-term debt and viability. However, the total debt has no significant relationship with viability. The chapter also finds out that access to debt is not the main factor affecting SMEs viability.

## **CHAPTER FIVE**

### **RESEARCH CONCLUSIONS AND RECOMMENDATIONS**

#### **5.0 Introduction**

This study sought to investigate the relationship between viability and access to debt. It also sought to establish if the type of debt matters to SME viability. The study also sought to establish if access to debt finance is the main factor correlated with viability as usually alleged in opinion and perception surveys. Descriptive statistical analysis and panel data regression model using Random Effects model were used to determine the direction, significance and magnitude of the relationship between viability and access to debt, as well as determining if access to debt is the main factor correlated to viability. This chapter gives conclusions and recommendations arising from the results of the study discussed in chapter 4.

#### **5.1 Conclusions and Recommendations**

The study results show that short-term debt has a positive statistically significant association with SME viability. Long-term debt has a negative relationship with viability. However, there is no significant relationship between total debt and SMEs viability. Therefore, there is no evidence that total debt matters to SME viability; but what matters is the type of debt. Short-term debt is positively related to SME viability while long-term debt is negatively related to viability. Therefore, it is recommended that SME managers and policy makers devise strategies that increase SMEs access to short-term debt in order to increase their viability. SMEs managers should closely monitor their levels of long-term debt as this is negatively associated with the viability of their enterprises.

Access to debt is not the main factor related to SMEs viability. The main factor is SMEs size. Long-term debt is the second factor, followed by the ratio of female to male shareholders SMEs, growth opportunities, short-term debt, and lastly number of employees. Therefore, SMEs managers are encouraged to closely monitor the sizes of their enterprise to avoid diseconomies of scale arising from the sizes of their enterprises. High growth opportunities should also be closely monitored as they may give rise to excessive risk taking which results to loss of viability. Female ownership of SMEs should be encouraged as the results demonstrate that those enterprises dominated by female shareholders are associated with high profitability. Thus females are capable owners of SMEs and they need to be supported. Also, SMEs managers should not over-emphasize cutting of costs through pursuing a small staff compliment as this is

associated with lower profitability. The results show that viability is associated with increasing the number of employees.

## **5.2 Limitations of Study**

One of the limitations of the study is that the study relied on secondary data analysis. The gathering and analysis of primary data would have enriched the study so as to get greater insight into the relationship between access to debt and viability. Numbers alone do not tell the full story and therefore qualitative analysis was needed in the form of in-depth interviews with key informants of SMEs.

The study assumes that viability is measured as profitability. However, viability is multidimensional, of which profitability is only one of the dimensions. Thus the study effectively analysed the profitability dimension of viability. Also, the SMEs studied were pooled from Harare only, which on its own might have created some biases in the data which could subsequently compromise quality of findings. Lastly, the research only covered firms within the agricultural sector, leaving out SMEs from other sector of the economy.

## **5.3 Recommendations for Further Research**

Given the abovementioned limitations of the study, further areas of study include studies that investigate the relationship between viability and debt access using both qualitative and quantitative approaches to deepen the understanding of the relationship. Reliance on secondary and quantitative data and analysis alone is not enough. Primary data collection would importantly create diversity to the types of data collected or used hence it should be attempted. It is also imperative to have studies that widen the sample of SMEs to other sectors of the economy to have results that can be generalized in a better way. Since viability is a multidimensional concept, it is important to have a study that examines the relation of access to debt with each dimension of viability. In this regard, multivariable multiple regression models could be useful so that it is established which variables affect which dimensions of viability in a single framework.

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## APPENDICES

### Appendix 1: General Shareholder & Manager Profiles

Firm ID	Years in Business	Av Staff size	Av. Asset Value (\$)	Av. Total Equity (\$)	Av. Short Term Debt (\$)	Av. Long term Debt	Av. Total Sales (\$)	Growth in Sales	Av. Net Profit (\$)	Av. Interest (\$)	Av. Return On Equity
8	30	5	4016820	3319149	613435	0	613435	15%	-206392	4930.6667	-0.0469
31	6	7	862270.3	669334	125341	129666.7	255008	9%	-91256	0	-0.11858
38	6	10	1222021	883507.7	26300	0	26300	-1%	-740.667	2133.3333	0.001283
39	13	18	2951826	2415140	14333	0	14333.33	20%	-20406	1030.6667	-0.00975

### Appendix 2: Debt to Asset Descriptive Statistics

	<i>SDTA</i>	<i>LDTA</i>	<i>TDTA</i>	<i>Sales growth</i>	<i>ROE</i>
<b>Mean</b>	12%	2%	14%	10%	31%
<b>Standard Error</b>	3%	1%	3%	4%	10%
<b>Median</b>	6%	0%	9%	7%	17%
<b>Mode</b>	0%	0%	#N/A	#N/A	#N/A
<b>Standard Deviation</b>	18%	4%	18%	24%	61%
<b>Sample Variance</b>	3%	0%	3%	6%	38%
<b>Range</b>	75%	15%	75%	162%	316%
<b>Minimum</b>	0%	0%	0%	-40%	-12%
<b>Maximum</b>	75%	15%	75%	122%	304%
<b>Sum</b>	5.040	0.765	5.805	4.267	12.648
<b>Count</b>	41	41	41	41	41

### Appendix 3: Average Data used in Descriptive Statistics

Firm ID	SDTA	LDTA	TDTA	Av. Growth in Sales	Av. Return On Equity
1	1%	1%	2%	12%	5%
2	37%	0%	37%	21%	56%
3	0%	8%	8%	3%	20%
4	5%	0%	5%	7%	7%
5	9%	0%	9%	66%	17%
6	5%	2%	6%	-6%	27%
7	67%	0%	67%	15%	127%
8	15%	0%	15%	15%	-5%
9	3%	1%	4%	17%	8%
10	11%	0%	11%	7%	16%
11	11%	2%	14%	5%	5%
12	43%	7%	50%	15%	53%
13	17%	0%	17%	27%	2%
14	9%	0%	9%	15%	304%
15	21%	0%	21%	0%	19%
16	9%	0%	9%	122%	4%
17	56%	0%	56%	20%	18%
18	7%	0%	7%	-4%	5%
19	17%	8%	25%	-40%	1%
20	75%	0%	75%	30%	17%
21	5%	0%	5%	1%	19%
22	5%	6%	11%	1%	18%
23	7%	0%	7%	-35%	17%
24	13%	0%	13%	3%	28%
25	8%	0%	8%	3%	33%
26	5%	5%	10%	16%	17%
27	1%	0%	1%	16%	29%
28	6%	0%	6%	1%	4%
29	1%	0%	1%	2%	4%
30	1%	0%	1%	-1%	31%
31	15%	15%	30%	9%	-12%
32	9%	0%	9%	14%	9%
33	0%	0%	0%	8%	2%
34	4%	0%	4%	-11%	14%
35	0%	12%	12%	6%	39%
36	0%	0%	0%	4%	254%
37	5%	0%	5%	7%	24%
38	2%	0%	2%	-1%	0%
39	0%	0%	0%	20%	-1%
40	2%	0%	2%	3%	17%
41	0%	8%	9%	14%	10%

## Appendix 3: Random Effects Models Estimated and Hausman Tests

### Equation 3: Random Effects Model

```
. xtreg lroe lstd lltd lsz lgopp lwkrs lexpe lnosh Busi FTMR lrgdpg linfl, re
```

```
Random-effects GLS regression           Number of obs   =   123
Group variable: ID                     Number of groups =    41
```

```
R-sq:  within = 0.2565           Obs per group: min =    3
      between = 0.3226           avg           =    3.0
      overall = 0.3012           max           =    3
```

```
Wald chi2(11) = 42.57
corr(u_i, X) = 0 (assumed)          Prob > chi2    = 0.0000
```

lroe	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
lstd	.3726116	.1694099	2.20	0.028	.0405743 .7046489
lltd	-1.555092	.3168293	-4.91	0.000	-2.176066 -.9341179
lsz	-.0907272	.0456108	-1.99	0.047	-.1801227 -.0013318
lgopp	-.0924547	.071256	-1.30	0.194	-.232114 .0472045
lwkrs	.2773517	.6210568	0.45	0.655	-.9398972 1.494601
lexpe	.0118779	.7169797	0.02	0.987	-1.393376 1.417132
lnosh	5.951237	4.720159	1.26	0.207	-3.300105 15.20258
Busi	.0609213	.0945879	0.64	0.520	-.1244676 .2463101
FTMR	.2001688	.0929448	2.15	0.031	.0180003 .3823374
lrgdpg	.5992344	1.764846	0.34	0.734	-2.8598 4.058269
linfl	-2.46036	3.208428	-0.77	0.443	-8.748763 3.828043
_cons	-8.453425	21.90196	-0.39	0.700	-51.38049 34.47363
sigma_u	.23762546				
sigma_e	.218066				
rho	.54284365	(fraction of variance due to u_i)			

### Hausman Test for Equation 3

```
. hausman roe_fe roe_re
```

---- Coefficients ----				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	roe_fe	roe_re	Difference	S.E.
lstd	.3907878	.3726116	.0181762	.1082496
lltd	-1.525704	-1.555092	.0293879	.1360964
lsz	-.085908	-.0907272	.0048193	.1108144
lgopp	-.0818844	-.0924547	.0105703	.0924572
lwkrs	1.03024	.2773517	.7528881	1.031156
lexpe	9.239144	.0118779	9.227266	41.93469
lrgdpg	.5335954	.5992344	-.065639	.8645949
linfl	2.044102	-2.46036	4.504462	20.71471

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
chi2(8) = (b-B)[(V_b-V_B)^(-1)](b-B)
        = 1.39
Prob>chi2 = 0.9944
```

### Equation 3: Random Effects Model

. xtreg lroa lstd lltd lsz lgopp lwkrs lexpe lnosh Busi FTMR lrgdpg linfl, re

Random-effects GLS regression                    Number of obs    =    123  
 Group variable: ID                                Number of groups =    41

R-sq: within = 0.5010                            Obs per group: min =    3  
           between = 0.2596                                avg    =    3.0  
           overall = 0.2984                                max    =    3

Wald chi2(11)    =    85.67  
 corr(u\_i, X) = 0 (assumed)                        Prob > chi2    =    0.0000

lroa	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
lstd	.1393498	.0766235	1.82	0.069	-.0108294 .2895291
lltd	-.3184573	.1352347	-2.35	0.019	-.5835124 -.0534022
lsz	-.1489848	.0280636	-5.31	0.000	-.2039883 -.0939812
lgopp	-.0997343	.033957	-2.94	0.003	-.1662888 -.0331797
lwkrs	.6218913	.3556179	1.75	0.080	-.075107 1.31889
lexpe	.7195071	.5024549	1.43	0.152	-.2652865 1.704301
lnosh	3.992673	3.332878	1.20	0.231	-2.539648 10.52499
Busi	.006349	.0676541	0.09	0.925	-.1262506 .1389486
FTMR	.1237469	.0666522	1.86	0.063	-.0068889 .2543828
lrgdpg	-.1888998	.7311186	-0.26	0.796	-1.621866 1.244066
linfl	-.3796561	1.343663	-0.28	0.778	-3.013187 2.253875
_cons	-14.0335	14.96157	-0.94	0.348	-43.35764 15.29064
sigma_u	.18133349				
sigma_e	.08748046				
rho	.81120279 (fraction of variance due to u_i)				

### Breusch-Pagan Lagrange multiplier (LM) Test for Random Effects for Equation 3

xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

$$lroe[ID,t] = Xb + u[ID] + e[ID,t]$$

Estimated results:

	Var	sd = sqrt(Var)
lroe	.1234271	.351322
e	.0475528	.218066
u	.0564659	.2376255

Test: Var(u) = 0

chibar2(01) = 28.71  
 Prob > chibar2 = 0.0000

## Hausman Test for Equation 4

. hausman roa\_fe roa\_re

---- Coefficients ----				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	roa_fe	roa_re	Difference	S.E.
lstd	.1854657	.1393498	.0461159	.0251674
lltd	-.3884958	-.3184573	-.0700385	.0291042
lsz	-.2456236	-.1489848	-.0966388	.0390316
lgopp	-.0222449	-.0997343	.0774894	.0322453
lwksr	.5692301	.6218913	-.0526612	.3266919
lexpe	12.06493	.7195071	11.34542	16.81769
lrgdpg	-.190017	-.1888998	-.0011173	.2949975
linfl	4.409666	-.3796561	4.789322	8.301063

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(8) &= (b-B)[(V_b-V_B)^{-1}](b-B) \\ &= 8.29 \\ \text{Prob}>\text{chi2} &= 0.4059 \end{aligned}$$

## Breusch-Pagan Lagrange multiplier (LM) Test for Random Effects for Equation 4

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{lroa}[\text{ID},t] = Xb + u[\text{ID}] + e[\text{ID},t]$$

Estimated results:

	Var	sd = sqrt(Var)
lroa	.0479178	.2189014
e	.0076528	.0874805
u	.0328818	.1813335

Test: Var(u) = 0

$$\begin{aligned} \text{chibar2}(01) &= 68.83 \\ \text{Prob} > \text{chibar2} &= 0.0000 \end{aligned}$$

## Equation 5: Random Effects

. xtreg lroe logtd lsz lgopp lwksr lexpe lnosh Busi FTMR lrgdpg linfl, re

Random-effects GLS regression                      Number of obs = 123  
 Group variable: ID                                      Number of groups = 41

R-sq: within = 0.0280                                      Obs per group: min = 3  
           between = 0.2430                                      avg = 3.0  
           overall = 0.1717                                      max = 3

Wald chi2(10) = 12.93  
 corr(u\_i, X) = 0 (assumed)                                      Prob > chi2 = 0.2277

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
logtd	-.0578523	.1701112	-0.34	0.734	-.3912641 .2755595
lsz	-.0621703	.0475412	-1.31	0.191	-.1553494 .0310087
lgopp	-.1131793	.0798943	-1.42	0.157	-.2697693 .0434106
lwksr	.1412257	.6582823	0.21	0.830	-1.148984 1.431435
lexpe	-.302774	.737158	-0.41	0.681	-1.747577 1.142029
lnosh	5.669138	4.867574	1.16	0.244	-3.871133 15.20941
Busi	.1085008	.0969324	1.12	0.263	-.0814832 .2984848

```

FTMR | .1764612 .095554 1.85 0.065 -.0108212 .3637436
lrgdpg | .7260292 2.035208 0.36 0.721 -3.262905 4.714963
linfl | -2.351246 3.695433 -0.64 0.525 -9.594162 4.891671
_cons | -11.62557 22.93833 -0.51 0.612 -56.58388 33.33274

```

```

-----
sigma_u | .2301982
sigma_e | .24628409
rho | .46627876 (fraction of variance due to u_i)
-----

```

## Hausman Test for Equation 5

```
. hausman fe re
```

```

----- Coefficients -----
| (b) (B) (b-B) sqrt(diag(V_b-V_B))
| fe re Difference S.E.
-----+-----
logtd | -.1346666 -.0578523 -.0768144 .0927374
lsz | .0694222 -.0621703 .1315925 .1210881
lgopp | -.1703701 -.1131793 -.0571907 .1026361
lwkrs | .4232284 .1412257 .2820027 1.181742
lexpe | 20.24991 -.302774 20.55269 47.29351
lrgdpg | .055038 .7260292 -.6709912 .8806183
linfl | 9.092894 -2.351246 11.44414 23.32803
-----

```

b = consistent under Ho and Ha; obtained from xtreg  
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```

chi2(7) = (b-B)[(V_b-V_B)^(-1)](b-B)
        = 5.63
Prob>chi2 = 0.5830

```

## Breusch-Pagan Lagrange multiplier (LM) Test for Random Effects for Equation 5

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

lroe[ID,t] = Xb + u[ID] + e[ID,t]

Estimated results:

```

| Var sd = sqrt(Var)
-----+-----
lroe | .1234271 .351322
e | .0606559 .2462841
u | .0529912 .2301982

```

Test: Var(u) = 0  
chibar2(01) = 20.85  
Prob > chibar2 = 0.0000

## Equation 6: Random Effects Model

```
. xtreg lroa logtd lsz lgopp lwkrs lexpe lnosh Busi FTMR lrgdpg linfl, re
```

Random-effects GLS regression                      Number of obs = 123  
Group variable: ID                                    Number of groups = 41

R-sq: within = 0.4312                                Obs per group: min = 3  
          between = 0.2759                                avg = 3.0  
          overall = 0.3036                                max = 3

Wald chi2(10) = 70.89  
 corr(u\_i, X) = 0 (assumed) Prob > chi2 = 0.0000

lroa	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
logtd	.02245	.070178	0.32	0.749	-1.150964 .1599964
lsz	-.1306718	.0276807	-4.72	0.000	-.1849251 -.0764186
lgopp	-.1082435	.0350423	-3.09	0.002	-.1769251 -.0395619
lwkrs	.53368	.3602279	1.48	0.138	-.1723537 1.239714
lexpe	.5549468	.4885116	1.14	0.256	-.4025183 1.512412
lnosh	4.074868	3.24882	1.25	0.210	-2.292702 10.44244
Busi	.0192121	.0656487	0.29	0.770	-.1094569 .1478811
FTMR	.116359	.0647719	1.80	0.072	-.0105915 .2433096
lrgdpg	-.2017027	.7729007	-0.26	0.794	-1.71656 1.313155
linfl	-.2474761	1.416444	-0.17	0.861	-3.023655 2.528703
_cons	-14.92878	14.6268	-1.02	0.307	-43.59678 13.73922

sigma\_u | .17730954  
 sigma\_e | .09375619  
 rho | .7814948 (fraction of variance due to u\_i)

## Hausman Test for Equation 6

. hausman roa\_logtd\_fe roa\_logtd\_re

---- Coefficients ----

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	roa_logtd_fe	roa_logtd_re	Difference	S.E.
logtd	.0309646	.02245	.0085146	.0226945
lsz	-.1993869	-.1306718	-.068715	.0410631
lgopp	-.0486616	-.1082435	.0595819	.0349812
lwkrs	.3917011	.53368	-.1419789	.3679904
lexpe	15.2859	.5549468	14.73096	17.9994
lrgdpg	-.3288014	-.2017027	-.1270988	.3395222
linfl	6.477206	-.2474761	6.724683	8.879053

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)[(V\_b-V\_B)^(-1)](b-B)  
 = 3.99  
 Prob>chi2 = 0.7812

## Breusch-Pagan Lagrange multiplier (LM) Test for Random Effects for Equation 6

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

lroa[ID,t] = Xb + u[ID] + e[ID,t]

Estimated results:

	Var	sd = sqrt(Var)
lroa	.0479178	.2189014
e	.0087902	.0937562
u	.0314387	.1773095

Test: Var(u) = 0

chibar2(01) = 66.67  
 Prob > chibar2 = 0.0000

**THE END**