SME Creditworthiness and Financing: Firm Size Effects

by

Michael Stephen Borish

A thesis submitted to the Faculty of Graduate and Postdoctoral Affairs
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Management

Carleton University
Ottawa, Ontario

© 2020, Michael Stephen Borish

Table of Contents

Acronyms	7
List of Tables	8
Abstract	12
I. Background	13
A. Purpose	13
B. Research Motivation	14
1. Credit Decision Making	14
2. Pledged Assets and Contribution to Firm-Level Credit Access	17
3. Loan Covenants and Credit Monitoring	19
C. Contribution of the Research	20
D. Context for Thesis Definitions and SME Characteristics	23
1. Context for Definitions	23
2. Thesis Definition and Presentation of SMEs	23
E. Global Credit Patterns	24
F. Structure of the Thesis	25
II. Literature Review and Conceptual Framework	27
A. Background	27
1. Supply Side Considerations for SME Access to Finance	27
2. Opportunities for SMEs to Access Credit	29
3. Collateral Framework Issues and Constraints for SMEs	30
4. Exogenous Challenges and Constraints for SMEs	31
B. Credit Decision Making Considerations	32
1. Firm Size and Credit Access	32
2. Legal and Institutional Framework for Credit Access	34
3. Listed Status and Credit Access	35
C. The Role of Collateral and Secured Transactions	36
1. Tangible Fixed Assets and Credit Access	36
2. Legal and Institutional Framework for Collateral and Credit Access	38
D. Loan Covenants and Monitoring of Credit Quality	40
1. Financial Covenants	40
2. Legal and Institutional Framework for Loan Agreement Enforcement	42
E. Relevance of Literature Review to Variable Selection	45

1.	Credit Decision Making	45
2.	Collateral and Secured Transactions	45
3.	Credit Monitoring.....	46
III.	Methodology and Data	48
A.	Original Research Plans	48
B.	General Methodology—Partitioning, Use of Dummy Variables and Testing.....	50
C.	Variable Selection in Relation to Theory and Research Objectives	55
D.	Background Information on Dependent and Independent Variables	57
E.	Data Collection, Processing and Statistical Testing	60
F.	Data and Sample.....	62
1.	Sample Data and Distribution Challenges	62
2.	Level 2 Sample Data Summary	63
3.	Data Limitations	64
IV.	Statistical Tests and Results—SME Firm Size Effects on Credit Access.....	67
A.	Background.....	67
B.	Univariate Data on SME Access to Total Bank Credit	68
1.	Total Credit Access in Dollar Value	68
2.	Access to Credit by Firm Size as a Share of Total Assets	72
3.	SME Access to Long-term Bank Credit in Dollar Value.....	75
4.	Access to LTD by Firm as a Share of Total Assets.....	79
5.	SMEs with No Access to Bank Credit.....	83
C.	GLM Procedure and ANOVA.....	85
1.	DEBT as Dependent Variable	85
2.	DEBT/ASSETS as Dependent Variable	86
3.	LTD as Dependent Variable	87
4.	LTD/ASSETS as Dependent Variable.....	88
D.	Linear Regression Results.....	89
1.	Step 1: Full Model Results—All Independent Variables and Dummies.....	92
2.	Step 2: All Independent Variables and Firm Size Dummies.....	95
3.	Step #3: All Legal and Institutional Variables and Dummy Variables.....	98
4.	Step #4: All Financial Independent Variables and Dummy Variables	101
5.	Step #5: All Financial Variables and Firm Size Dummies	105
6.	Step #6: All Financial Variables and Firm Size Dummies with Income Level Dummy	107

7.	Step #7: All Financial Variables and Firm Size Dummies with Regional Dummies	109
8.	Step #8: All Financial Variables and Firm Size Dummies with Listed Status Dummy.....	111
9.	Step #9: All Financial Variables and Firm Size Dummies with Sector Dummies	113
E.	2-Pairwise t-Test	115
F.	Main Observations.....	116
V.	Statistical Tests and Results—Log Transformation Robustness Tests	117
A.	Introduction.....	117
B.	Regression Results for OPRE Log Transformation	117
1.	Step #1: Full Model Results—All Independent Variables and Dummies.....	120
2.	Step #2: All Independent Variables and Firm Size Dummies.....	123
3.	Step #3: All Legal and Institutional Variables and Dummy Variables.....	126
4.	Step #4: All Financial Independent Variables and Dummy Variables	130
5.	Step #5: All Financial Variables and Firm Size Dummies	134
6.	Step #6: All Financial Variables and Firm Size Dummies with Income Level Dummy	136
7.	Step #7: All Financial Variables and Firm Size Dummies with Regional Dummies	138
8.	Step #8: All Financial Variables and Firm Size Dummies with Listed Status Dummy.....	140
9.	Step #9: All Financial Variables and Firm Size Dummies with Sector Dummies	142
C.	Main Observations.....	144
VI.	Statistical Tests and Results—Large-Scale Firm Size Dummy Effects on Credit Access.....	145
A.	General Approach	145
B.	Baseline Regression Results for Large-Scale Firm Size Dummy Effects	147
1.	Step #1: All Financial Independent Variables and Small-Large Firm Size Dummy Variables....	147
2.	Step #2: All Financial Independent Variables and Medium-Large Firm Size Dummies.....	148
3.	Step #3: All Financial Independent Variables and Small-Large Firm Size and Income Dummies	150
4.	Step #4: All Financial Independent Variables and Medium-Large Firm Size and Income Dummies	152
5.	Step #5: All Financial Independent Variables and Small-Large Firm Size and Sector Dummies	154
6.	Step #6: All Financial Independent Variables and Medium-Large Firm Size and Sector Dummies	156
C.	Log Transformation Regression Results for Large-Scale Firm Size Dummy Effects	158
1.	Step #1: All Financial Independent Variables and Small-Large Firm Size Dummies	160
2.	Step #2: All Financial Independent Variables and Medium-Large Firm Size Dummies.....	161

3.	Step #3: All Financial Independent Variables and Small-Large Firm Size and Income Dummies	163
4.	Step #4: All Financial Independent Variables and Medium-Large Firm Size and Income Dummies	165
5.	Step #5: All Financial Independent Variables and Small-Large Firm Size and Sector Dummies	167
6.	Step #6: All Financial Independent Variables and Medium-Large Firm Size and Sector Dummies	169
D.	Main Observations.....	171
VII.	Findings and Observations	172
A.	General Observations	172
B.	Summary of Testing Results	174
C.	Methodological Issues and Future Research.....	178
VIII.	Conclusions.....	180
A.	General Conclusions	180
B.	Research Questions and Hypotheses.....	181
1.	Firm Size and Credit Origination Decision Making: Borrower and Lender	183
2.	Pledged Assets, Collateral and Secured Transactions	184
3.	Credit Monitoring.....	185
C.	Policy Implications	185
D.	Final Lessons of SME Credit Access in Relation to Independent Variables	186
	Annex 1: Summary of Variables from the Literature	188
	Annex 2: Data Collection and Coverage	193
A.	Descriptive Company Information and Geographic Classification of Market Activity.....	194
1.	Classification of Countries and Regions	194
2.	Regional Groupings	195
3.	Industrial Classification	195
4.	Financial Versus Non-Financial	196
B.	Firm-Level Data	196
C.	Global Profile Data	198
	Annex 3: Results of Skewness and Kurtosis Testing from Original Research	200
A.	Skewness and Kurtosis Testing of the Original Segmented Model	200
B.	Skewness and Kurtosis Results of the OPRE Log Transformation	203
C.	Winsorized and Trimmed Means of OPRE Log Transformation	205

Annex 4: Heteroscedasticity Test Results	207
REFERENCES	210
ENDNOTES	224

Acronyms

ASPAC	Asia-Pacific
CMLTD	Current Maturities of Long-term Debt
CONTRENF	Contract Enforcement
CREDINFO	Credit Information
DF	Degrees of Freedom
EAD	Exposure at Default
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
ECB	European Central Bank
ERM	Enterprise Risk Management
EU	European Union
GDP	Gross Domestic Product
IC	Interest Coverage
IMM	Immoveable Assets
INSOLV	Insolvency Framework
INTEXP	Interest Expense
ISO	International Standards Organization
LGD	Loss Given Default
LRI	Legal Rights Index, and used interchangeably with LRINDEX
LTD	Long-term Debt
MINSH	Minority Shareholder Rights
MOV	Moveable Assets
NPV	Net Present Value
NWC	Net Working Capital
OECD	Organization of Economic Cooperation and Development
OPPL	Operating Profits
OPRE	Operating Revenues
PD	Probability of Default
PPE	Property, Plant and Equipment
R&C	Resources and Construction
R&D	Research and Development
REGEFF	Regulatory Effectiveness
ROA	Return on Average Assets
ROE	Return on Average Equity
SIC	Standard Industrial Classification Code
SME	Small and Medium-Sized Enterprises
TFA	Tangible Fixed Assets
UK	United Kingdom
USA	United States
VIV	Variance Inflation Value

List of Tables

Table 1	Summary of Hypotheses
Table 2	Summary of Research Contributions in Relation to Stated Motivations
Table 3	Global Context for Credit Allocation
Table 4	Legal and Institutional Variable Scores for Determination of Medians
Table 5	Overview of Dependent Variables, Independent Variables and Category of Interest Dummy Variables
Table 6	Level 2 Sample of Firms by Year of Financial Reporting
Table 7	Sample Statistics
Table 8	Overview of Frequency Distribution of SME Firms with Access to Bank Credit
Table 9	Firm Access to Bank Credit by Dollar Value
Table 10	Means Procedure for Distribution of Access to Bank Credit and Corresponding Credit Values
Table 11	Firm Access to Bank Credit as a Share of Firm Level Assets
Table 12	Means Procedure for Distribution of Access to Bank Credit/Assets and Corresponding Values
Table 13	Firm Access to Long-term Credit based on Dollar Value
Table 14	Means Procedure for Distribution of Access to Long-term Credit and Corresponding Credit Values
Table 15	Firm Access to Long-term Credit as a Share of Firm-Level Assets
Table 16	Means Procedure for Distribution of Access to Long-term Credit as a Share of Firm-Level Assets
Table 17	Overview of Frequency Distribution of SMEs Without Access to Bank Credit
Table 18	Number of Firms without Access to Long-term Bank Credit
Table 19	ANOVA Results for Level 2 Sample with DEBT as the Dependent Variable
Table 20	ANOVA Results for Level 2 Sample with DEBT/ASSETS as the Dependent Variable
Table 21	ANOVA Results for Level 2 Sample with Long-term Debt as the Dependent Variable
Table 22	ANOVA Results for Level 2 Sample with LTD/ASSETS as the Dependent Variable
Table 23	Overview of All Baseline Regression Equations
Table 24	Full Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 25	Full Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 26	Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 27	Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 28	All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 29	All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 30	All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 31	All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 32	All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

Table 33	All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 34	Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 35	Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 36	Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 37	Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 38	Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 39	Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 40	Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 41	Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 42	Results of 2-Pairwise t-test by Firm Size for DEBT/ASSETS vs. LTD/ASSETS as Dependent Variables
Table 43	Overview of All Log Transformation Regression Equations
Table 44	Full Model ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 45	Full Model ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 46	Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 47	Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 48	All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 49	All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 50	All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 51	All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 52	All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 53	All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 54	Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 55	Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 56	Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

Table 57	Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 58	Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 59	Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 60	Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 61	Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 62	Overview of Baseline Regression Equations for Large-Scale Firm Size Effect
Table 63	Financial Independent Variables and Small-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 64	Financial Independent Variables and Small-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 65	Financial Independent Variables and Medium-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 66	Financial Independent Variables and Medium-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 67	Financial Independent Variables and Small-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 68	Financial Independent Variables and Small-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 69	Financial Independent Variables and Medium-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 70	Financial Independent Variables and Medium-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 71	Financial Independent Variables and Small-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 72	Financial Independent Variables and Small-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 73	Financial Independent Variables and Medium-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable
Table 74	Financial Independent Variables and Medium-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable
Table 75	Overview of Large-Scale Firm Size Regression Equations
Table 76	All Financial Variables and Small-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 77	All Financial Variables and Small-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 78	All Financial Variables and Medium-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 79	All Financial Variables and Medium-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

Table 80	Financial Variables and Small-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 81	Financial Variables and Small-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 82	Financial Variables and Medium-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 83	Financial Variables and Medium-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 84	Financial Variables and Small-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 85	Financial Variables and Small-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 86	Financial Variables and Medium-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable
Table 87	Financial Variables and Medium-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable
Table 88	Summary of Test Results
Table 89	Summary of Hypothesis Results in Relation to Core Research Questions
Table 90	Summary of Variables, Relation to Research Themes, and Authors/Sources
Table 91	Summary of Key Data Coverage Features
Table 92	Data Retrieval Steps
Table 93	Global Data
Table 94	Summary of Comparatively Large Sample Sizes in Journal Articles Reviewed
Table 95	Skewness and Kurtosis Values for Baseline Distributions of Level 2 Sample
Table 96	Winsorized Skewness and Kurtosis Indicators
Table 97	Trimmed Means Skewness and Kurtosis Indicators
Table 98	OPRE Log Transformation Skewness and Kurtosis Indicators
Table 99	Winsorized Skewness and Kurtosis Indicators in OPRE Log Transformation
Table 100	Trimmed Means Skewness and Kurtosis Indicators in OPRE Log Transformation
Table 101	White Test Results for Heteroscedasticity—Financial Independent Variables re DEBT/ASSETS and LTD/ASSETS
Table 102	White Test Heteroscedasticity Results—Financial Independent Variables re logDEBT/ASSETS and logLTD/ASSETS

Abstract

The thesis profiles SME access to finance for more than 31,000 firms in high-income and emerging markets, with financial accounting data for more than 15,000 emerging markets firms. SMEs account for nearly 40% of the total sample. The author finds (1) bank credit allocation favoring large-scale businesses versus SMEs is rational due to large firms' positive financial performance indicators, fees paid, disclosure practices and market power (demand side) as well as creditor operational efficiency and cost effectiveness from lending economies of scale (supply side); (2) despite this, large-scale lenders have an interest in financing SMEs for portfolio diversification and management of concentration risk, while mid-sized lenders often provide credit to SMEs due to the lender's more limited capital and/or business model orientation as a "stakeholder" institution; (3) multivariate statistical tests reveal less consistently positive correlation between firm size and credit access than expected, although this partly reflects testing issues and narrow bounds of SME classifications; by contrast, (4) univariate indicators show a very high level of credit access by large-scale firms that dwarf credit access of SMEs, and support arguments of firm size bias in favor of large-scale firms in credit access and "low leverage puzzle" theory.

Weakness in moveable property registries makes it harder for firms to value and pledge machinery and equipment as assets for secured transactions. Correspondingly, SMEs are constrained in their access to credit, particularly LTD, because the legal and institutional environment works against them due to their dependence on machinery and equipment for operations and because these are the predominant fixed assets they have to pledge as collateral. Despite this, positive correlation of markets with high credit access and strong legal and institutional variables shows firms in stronger environments for credit information, minority shareholder protection, regulatory effectiveness, property registration, contract enforcement and insolvency resolution have better chances of accessing credit (consistent with institutional theory).

More generally, legal and institutional variables are weak descriptors in relation to dependent variables, whereas financial indicators are stronger. Category of interest dummy variables for income levels, listed status and sector also showed good results, whereas regional indicators were less reliable.

I. Background

A. Purpose

The purpose of this thesis is to contribute to existing research on the role of credit access for small and medium-sized enterprises (SMEs) in comparison with credit access for large-scale firms, with a particular focus on less studied or examined emerging markets as opposed to the more prevalently studied high-income markets.¹ More specifically, the thesis seeks to (1) identify issues that pertain to the imbalance or *perceived* imbalance of credit allocation to large-scale firms (defined as firms with annual revenues exceeding \$50 million) at the expense of SMEs (defined as businesses with annual revenues of \$2-\$50 million), (2) see if such patterns are truer in emerging markets than in high-income markets, and (3) determine if such patterns predominate across economic sectors. (The research also selectively tests for whether listed market status is also a factor, although this is less of a focus than the other areas specified above.)

The main research question is:

- Is credit access positively correlated with firm size in all markets and sectors, or are there deviations from this?

Other questions that are explored in the research (through the Literature Review and analysis of univariate data and results of regression analyses) include:

- Do tangible fixed assets that can be pledged as collateral facilitate credit access? If so, is the value of tangible fixed assets positively correlated with firm size in all markets and sectors, and therefore positively correlated with credit access in all markets and sectors?
- Do legal and institutional factors play an important role in credit decision making and credit monitoring across markets and sectors?
- How do selected financial variables compare with legal and institutional variables as independent variables in relation to dependent variables for credit access?

The above focus is pursued based on the following hypotheses in Table 1:

Table 1: Summary of Hypotheses	
	Credit Decision Making
H1	<i>If firms are comparatively large, then they will have greater credit access than smaller firms as a share of firm-level assets. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.</i>
H2	<i>If firms operate in markets with more available credit information, stronger protection of minority shareholder rights, and greater regulatory effectiveness, then they will have higher levels of credit access than firms in markets with weaker laws and institutions. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.</i>
H3	<i>If firms are listed on a stock exchange, then they will have greater access to credit than unlisted firms. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.</i>
	Contribution of Pledged Assets to Firm-Level Credit Access
H4	<i>If firms are comparatively large, then they will have a higher dollar value of tangible fixed assets that can be pledged to secure loans when compared to smaller firms, resulting in higher levels of credit access in all markets (high-income and emerging) and sectors. This extends as well to long-term credit access in all markets (high-income and emerging) and sectors.</i>
H5	<i>If firms operate in markets with stronger property registration systems for immovable and moveable assets, then they will have higher levels of credit access. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.</i>
	Loan Covenants and Credit Monitoring
H6	<i>If firm size is positively correlated with favorable financial covenant indicators used in loan agreements for borrower debt service (timely and full principal and interest payments), then larger firms will benefit from greater credit access than smaller firms. This applies to all markets (high-income and emerging), to listed and unlisted firms, and in all sectors.</i>
H7	<i>If firms operate in markets with better contract enforcement and insolvency resolution, they will have higher levels of credit access than firms operating in markets with less effective contract enforcement and insolvency resolution. This applies in all markets (high-income and emerging), to listed and unlisted firms, and in all sectors.</i>

The primary motivations behind the research are (1) to provide a comprehensive profile of credit access by firm size across the globe, (2) assess financial accounting data in relation to SME credit access and compare these results with access to credit by large-scale firms, (3) increase the range of data for the above in the review of emerging markets patterns, and (4) evaluate the degree to which selected financial accounting ratios help to explain patterns compared with lessons derived from information on legal and institutional frameworks. The specific motivation behind each of the subsections is discussed below. (Annex 1 provides a comprehensive list of variables evaluated in the Literature Review to determine which ones to use for statistical testing.)

B. Research Motivation

1. Credit Decision Making

The purpose of this part of the research is to examine factors that influence decision making by lenders, and more specifically (a) whether there is a firm size bias in relation to SME access to credit, and (b) if so, whether this pattern applies in all high-income and emerging markets and across all sectors. The research tries to disaggregate SME access into short-term and long-term (greater than one year) credit, as access to long-term credit is a challenge for many SMEs in high-income markets (Mac an Bhaird, Vidal, & Lucey, 2016; Rahaman, 2011) and even more so in emerging markets with weak legal and institutional structures

and comparatively underdeveloped financial markets (Bena & Ondko, 2012; Ngcobo, 2018). This observation is based on assumptions that (a) access to finance is highly dependent on firm size (Daskalakis, Balios, & Dalla, 2017; Daskalakis, Eriotis, Thanou, & Vasiliou, 2014; Öztekin, 2015; Ramalho & da Silva, 2009) and growth (Belkhir, Maghyereh, & Awartani, 2016a; Rahaman, 2011), with growth prospects also dependent on firm size (Bentzen, Madsen, & Smith, 2012); therefore, emerging markets firms face greater difficulties accessing bank credit as they are smaller on average than firms in high-income markets; (b) most long-term credit (from banks) is used by firms to invest in tangible fixed assets (Mac an Bhaird & Lucey, 2011; Öztekin, 2015) needed for small firms to scale up and have a better chance of surviving and competing; therefore, as emerging markets have weaker legal and institutional environments, it is harder for emerging market SMEs to access needed funding for tangible fixed assets; (c) tangibility of assets is an important component of all debt financing for all SMEs because of the role these assets play as collateral (Mac an Bhaird & Lucey, 2011), and in the transmission of signals about firm-level creditworthiness (Berger, Espinosa-Vega, Frame, & Miller, 2011; Berger, Frame, & Ioannidou, 2016; Drakos & Giannakopoulos, 2011; Godlewski & Weill, 2011; Niinimäki, 2011; Uchida, 2011); therefore, SMEs in emerging markets face greater challenges in transmitting signals precisely because they face difficulties accessing needed long-term financing in the first place to acquire the tangible fixed assets needed to send those signals; and (d) firm size is a factor in relation to both access to and price of credit (Dietrich, 2012); therefore, SMEs in all markets must pay higher interest rates and fees than large-scale firms, resulting in less overall access to credit and/or higher interest expense ratios on the credit they do access.

The profile of SME credit access is presented in relation to large-scale firms as a reference to those that have achieved comparatively high levels of investment to generate scale in their operations. The profile does not differentiate between secured and unsecured exposures, although institutional considerations partly account for these in terms of creditor information and legal rights which influence the framework and incentives for lending (Acharya, Amihud, & Litov, 2011b; An, Li, & Yu, 2016; Houston, Lin, Lin, & Ma, 2010; Kyröläinen, Tan, & Karjalainen, 2013; Lucey & Zhang, 2011; Öztekin, 2015) and borrowing (Cho, El Ghoul, Guedhami, & Suh, 2014). (The role of property registration for immovable and moveable assets is dealt with more specifically below in the section on Contribution of Pledged Assets to Firm-Level Credit Access, while bankruptcy, insolvency resolution and contract enforcement are dealt with in Loan Covenants and Credit Monitoring.)

The focus of the research on long-term credit translates into a focus that is primarily from banks and bond markets. It does not focus on non-bank trade credit (e.g., accounts payable), although it recognizes that some bank credit (e.g., lines of credit) is used for trade credit and working capital management purposes (Ferrando & Mulier, 2013). This approach corresponds to other studies that have presented financial structure, capital structure or leverage as dependent variables based on a narrow focus on non-trade debt as a share of total assets (Caneghem & Campenhout, 2012; Ramalho & da Silva, 2009).

As a share of total assets, the sample distributions for firms reporting debt show long-term debt (LTD) approximates 21% of assets, of which 16% are not due in the current year and 5% are (i.e., current maturities of LTD, or CMLTD). Lines of credit account for 11.5% of assets. Therefore, LTD (including CMLTD) accounts for about two thirds of debt and lines of credit for about one third. These shares are

similar to separate research that reports lines of credit account for about 15% of total corporate assets (Lins, Servaes, & Tufano, 2010). This research claims lines of credit are used not only for working capital purposes but also to (a) exploit business opportunities as they emerge (e.g., capital investment needs, undervalued properties or securities purchases) and (b) hedge liquidity and market risks, particularly when external credit markets are poorly developed. Therefore, depending on levels of external credit market development and the specific access and preferences of firms, there are overlapping uses of lines of credit in both working capital and fixed asset investment.

As for long-term debt, the sample of firms in the research reporting relevant financial accounting information shows LTD (including CMLTD) to approximate 90% of total debt when all figures are summed. For emerging markets (EM), the figures are lower at 78% of total EM debt, but higher than the 43% average long-term debt maturity profile of 24 publicly-listed emerging markets firms during the period 1995-2007 (Lucey & Zhang, 2011). The difference in the figures may reflect increased credit access in emerging markets since 1995-2007, particularly after the global crisis in 2008 and with rising credit levels in China and other major EM economies. This is assumed to be the case primarily in Asia-Pacific where domestic credit to GDP is highest in the world, and where emerging market Asia-Pacific ranks third globally after high-income markets in Asia-Pacific and North America.

Debt components are broken down by maturity for purposes of measurement and analysis. The focus of the research is on bank (and bond) financing and does not focus on the considerable literature that addresses working capital, gross payables, cash flow intensity or other themes related to trade credit (Banos-Caballero, Garcia-Teruel, & Martinez-Solano, 2010; Ben-Nasr, 2016; Box, Davis, Hill, & Lawrey, 2018; Caglayan, Maioli, & Mateut, 2012; Chen & Kieschnick, 2018; Fabbri & Klapper, 2016).

As for the use(s) of bank (and bond) debt, some sources claim that (a) there is little differentiation in results between broad (e.g., total liabilities to assets) and narrow (e.g., total debt to assets) definitions of leverage (Caneghem & Campenhout, 2012), and (b) use of the broader definition increases sample size (Coricelli, Driffield, Pal, & Roland, 2012). Others cite considerable differences in results (Cole, 2013) and adopt the narrow definition of leverage (Billett, Elkamhi, Popov, & Pungaliya, 2016b; Caneghem & Campenhout, 2012; Coricelli et al., 2012; Dasilas & Papasyriopoulos, 2015; Demiroglu & James, 2010; Guida & Sabato, 2017a; Lucey & Zhang, 2011; Tian & Yu, 2017) because it corresponds most closely to predictions of theory (Jöeveer, 2013) and capital structure decision making (Ramalho & da Silva, 2009). The narrow definition is used in this thesis to ensure alignment with research objectives.

Based on the above, the first motivation for conducting the research is to contribute to the literature on SME credit access in general, but with a focus on firms in emerging markets, all based on relatively recent financial accounting data. It does so by providing comparative information on credit access by firm size and market as well as higher level data on domestic credit relative to GDP. This helps to set the stage for analysis of firms across the globe based on financial disclosures that are typically difficult to access outside of major OECD markets. (This is relevant for all the hypotheses.)

A second motivation is to determine whether there is a firm size hierarchy in credit access, which is at the heart of the main research question. In other words, is there positive correlation between firm size (based on annual revenues) and credit access (based on dollar value of credit and/or as a share of firm assets)? If so, this would suggest growth is critical to smaller firms' ability to access external finance and, increasingly, long-term finance, and would apply in all markets and sectors. If not, other factors may be more important, such as willingness and capacity of smaller firms to invest in appropriately scaled enterprise risk management systems to the extent possible to strengthen firm-level creditworthiness, reduce internal and external information opaqueness, and strengthen the quality of disclosures. (This is relevant for Hypothesis 1.)

A third motivation addresses whether the strength of the institutional framework for credit allocation plays a role in credit access. If so, this suggests the institutional framework for creditor legal rights and information flows, levels of financial disclosure, and the general business environment have a direct impact on smaller firms' ability to access external finance and, increasingly, long-term finance. If not, other factors (e.g., firm financials, project Net Present Value/return prospects, relationship with lenders) may be more important. (This is relevant for Hypothesis 2.)

A fourth motivation addresses if there is a firm size hierarchy that is also characterized by listed (on stock exchanges) versus unlisted status of firms. In other words, is there increased access to credit within each firm size quantile (i.e., large, medium, small) that indicates greater access to credit by listed firms as opposed to unlisted firms? If so, this would suggest that not only firm size, but minority investor protections, stock exchange listings, disclosure requirements and corporate governance standards would also be a factor in the capacity of firms to access external finance, including long-term credit (e.g., bank loans, bond issuances). At the firm level, this would also suggest willingness and capacity to invest in enterprise risk management systems, which is typically the purview of large, listed companies and regulated financial firms like banks and insurance companies (Farrell & Gallagher, 2015; Hoyt & Liebenberg, 2011) and not SMEs, although there is evidence changes may be under way among SMEs in some markets to address these shortcomings (Torre, Soledad, Pería, & Schmukler, 2010). (This is relevant for Hypothesis 3.)

2. Pledged Assets and Contribution to Firm-Level Credit Access

The purpose of the research on pledged assets and collateral is to build on the earlier examination of factors that influence decision making by lenders in relation to firm size effects and SME access to credit. From the supply side, lenders are often unwilling to lend to SMEs because they have less in the way of tangible assets to collateralize (Daskalakis et al., 2017, 2014). Therefore, small-scale firms typically have less borrowing power in the market (Chong, Lu, & Ongena, 2013)² as they are smaller and have less in the way of assets to pledge as collateral. This limits the attractiveness of their financing options (Berger et al., 2016) and adds to the estimated per unit costs for lenders of approving loans to smaller borrowers (Campello & Hackbarth, 2012) to cover higher screening costs (Sengupta, 2014) unless SMEs can offer collateral and/or guarantees (Beck, 2013; Chiou & Shu, 2017; Godlewski & Weill, 2011) that help reduce lenders' expected and realized loss given default (Norden & van Kampen, 2013).

As with all aspects of the thesis, SME and emerging market indicators are benchmarked against comparable indicators in high income markets and how this affects SME access to external finance, specifically bank debt. As the research includes interest in SME access to *long-term* bank debt for capital investment purposes, the focus of collateral and secured transactions is critical in better understanding SME access to long-term (greater than one year) credit. Research has long demonstrated that a favorable legal and institutional environment for secured transactions is positively correlated with increased credit access and longer debt maturities for borrowers across sectors (Cho et al., 2014; Hall, 2012a; Houston et al., 2010; Kyröläinen et al., 2013), although firm size access has not always been tested and the relationship is not linear. Alternative research has demonstrated that strong creditor rights can also lead to lower corporate leverage, although this sample is focused on larger companies about which data on mergers and acquisitions activity is made available (Acharya, Amihud, et al., 2011b).

Building on earlier literature and observations from the Credit Decision Making section, this section focuses financially on the role of tangible fixed assets (also referred to as property, plant and equipment, or PPE) as collateral for loans. This includes immoveable (property and plant) and moveable (machinery and equipment) assets but excludes inventories and other working capital moveable assets. The exclusion of inventories and other working capital assets differs from a number of studies that include these assets (Calomiris, Larrain, Liberti, & Sturgess, 2017a; Caneghem & Campenhout, 2012; Dewaelheyns & Van Hulle, 2010; Ramalho & da Silva, 2009), but is consistent with other studies that are more focused on net fixed and tangible fixed assets (Belkhir et al., 2016a; Cole, 2013; Dasilas & Papasyriopoulos, 2015; Gao & Zhu, 2015; Guida & Sabato, 2017b; Lucey & Zhang, 2011). The evaluation of the role of pledged assets as collateral for secured transactions also looks at the institutional framework by including property registration systems and moveable collateral registries as dummy variables, partly inspired by research on how collateral laws and institutions shape and spur lending activity (Calomiris et al., 2017a; Love, Martinez Peria, & Singh, 2016).

Because the focus of this research is on tangible fixed assets, intangible assets like goodwill are excluded. The problem of collateral is even more challenging for firms with little or no tangible assets (Rampini & Viswanathan, 2013).³ In recent decades, many “innovative” firms in knowledge-based industries with considerable investment in intangible assets (e.g., intellectual property) have found that conventional lenders are unwilling or even unable to provide credit (Beck, De Jonghe, & Schepens, 2013; Berkowitz, Lin, & Ma, 2015). Therefore, SMEs with mainly intangible assets have a harder time accessing credit, including trade credit (Fabbri & Menichini, 2010). This is true in high-income economies, and even more challenging in many emerging markets where immoveable assets are often the only assets that can be pledged as collateral for loans (Chen, Lobo, Wang, & Yu, 2013).⁴ These challenges are noted here due to their significance, but are otherwise not the focus of the research.

These observations serve as context for the fifth motivation, which is to address whether there is a firm size hierarchy in credit access that is directly influenced by the presence of tangible fixed assets that can be pledged as collateral. In other words, is there positive correlation between firm size (based on annual revenues) and credit access resulting from a disproportionate share of tangible fixed assets the larger the firm? If so, this would relate to the pecking order theory (Myers & Majluf, 1984) and suggest growth is

critical to the ability of smaller firms to generate the internal financing (from cash and retained earnings) required to acquire tangible fixed assets to ultimately access external finance and, increasingly, long-term finance. This would apply in all markets and sectors. (This is relevant for Hypothesis 4.)

A sixth motivation is to address whether the strength of the institutional framework for collateral and secured credit plays a role in credit access. If so, this suggests the institutional framework for property rights and registration have a direct impact on smaller firms' ability to access external finance and, increasingly, long-term finance. (This is relevant for Hypothesis 5.)

Based on the results above, the research examines whether these patterns are similar or different in high-income and emerging markets and across sectors. If different, this suggests there are multiple explanations for the results. One study notes the presence of collateral in loan contracts is mainly determined by the borrower's risk characteristics, loan variables like loan tenor and price, and firm size and location (Yaldiz Hanedar, Broccardo, & Bazzana, 2014). Therefore, there is more to the determination of loan approval and terms than the simple presence of collateral, and not all collateral is equivalent in characteristics or value. Therefore, the actual underlying type of collateral is important in credit allocation, but other factors are important as well. (These points are relevant for all hypotheses.)

3. *Loan Covenants and Credit Monitoring*

The purpose of this research is to examine the role of covenants in loan agreements and legal and institutional framework issues that guide *ex-post* monitoring of credit quality (i.e., loan performance). As with the other sections assessing credit decision making and the role of collateral, this includes a combination of financial and institutional variables. The former is drawn specifically from performance benchmarks often used by banks to monitor credit quality. The latter reflects legal and institutional framework characteristics that influence outcomes when credit quality is jeopardized by market or other forces. This includes resolution of disputes when they occur on loans in default, as well as financial indicators that reflect borrower capacity to service and repay obligations in a timely manner.

Therefore, a seventh motivation for the research is to address whether there is a firm size hierarchy in credit performance indicators due to the superior capacity of large-scale firms to comply with loan covenants? In other words, is there positive correlation between firm size (based on annual revenues) and credit performance that justifies increased access to credit? If so, this suggests that larger firms perform better and are, therefore, more worthy of credit access, while SMEs do not show comparable levels of performance and are, therefore, less creditworthy. These conditions would apply in all markets and sectors. If not, other factors may be more important in explaining firm size patterns in credit access, including economies of scale in loan processing for lenders, the presence of collateral to secure transactions, and general reservations lenders may have regarding the limitations of SME borrower disclosures. An alternative plausible position regarding the above would be that SMEs have to comply with stricter financial covenants due to their relative shortage of collateral for secured transactions, weaker risk management systems, and reduced capacity to manage capital structure according to trade-off theory options. (Both are relevant for Hypothesis 6.)

The research also addresses whether the legal and institutional framework for contract enforcement and insolvency plays a role in smaller firms' ability to access external finance and, increasingly, long-term finance. Notwithstanding the possibility of a favorable response, the research seeks to test for patterns that may indicate that financial covenants are stricter for small firms that can access bank credit than they are for large firms. (This is relevant for Hypothesis 7.)

C. Contribution of the Research

SME research is broad and diverse, and often suffers from an absence of standardization in definitions and data. The former is understandable based on differing objectives of the research. For instance, public policy focused on SMEs often emphasizes job creation and employment, resulting in head count as the main unit of measure for profiling firm size. The availability of relatively current labor market statistics in OECD markets facilitates this approach. However, SME research focused on global competitiveness requires different data and information to assess firm-level productivity, efficiency and financial performance. These are often lacking, and when available, the research is often carried out on a country-specific basis. Therefore, core gaps in the research include (1) scattered definitions of what constitutes an SME, (2) varied data sets that are inconsistent across markets, and (3) limited focus on SMEs in emerging markets due to data limitations.

The research in this thesis seeks to close these gaps by (1) comparing credit access patterns for SMEs to those found for large-scale firms, (2) assessing these patterns on a global and regional basis, and (3) using financial accounting data as the basis of the research.

The primary contribution of the research is to provide observations based on a global sample of firms that (1) broadly accounts for most global GDP and a major share of institutional credit (Level 1 sample of about 1.2 million firms), while (2) mainly focusing on more detailed financial accounting data for more than 31,000 firms, of which more than 15,000 are from emerging market firms (Level 2 sample), accounting for about half of the Level 2 sample. The Level 1 data collection is composed of firms that disclose revenue levels that can be used to profile the distribution of firms in markets by firm size using annual revenues as a proxy for firm size. The Level 2 sample is derived from the Level 1 sample and is composed of firms that report a sufficient level of financial accounting information to be useful for the research.

Historically, most SME finance research has focused on firms in OECD markets like the US, higher income European Union countries, Japan and Australia where data are widely available. By contrast, data on emerging markets firms are less widely available. Therefore, the thesis contributes to previous research on SME finance by constructing a comprehensive data set for *active* SMEs⁵ in 168 emerging markets as well as 25 high-income countries for comparative purposes. The former is composed of virtually all emerging markets, with or without listed companies. The latter includes all major markets in North America, Europe and Asia-Pacific. (Annex 2 provides details on the thesis sample of firms, methods, and markets that are included and excluded.)

The research focuses on the seven hypotheses elicited from the Literature Review. Based on the above, the contribution of the research is to identify patterns in SME credit access across income levels, regions and sectors with firm size as a unit of measure for comparative patterns. The main objective is (1) to test for firm size effects in credit access (by firms) and whether conventional views of SME credit constraints

hold, and (2) if so, whether this is due to legal and institutional challenges in the business environment, inferior SME financial performance relative to larger firms, lack of assets to pledge as collateral, or any combination of those factors.

More specific contributions from the research include fulfillment of the motivations described above. These are summarized in Table 2 below.

Table 2: Summary of Research Contributions in Relation to Stated Motivations

	Research Motivations	Research Contribution
1	To contribute to the literature on SME credit access in general, but with a focus on firms in emerging markets, all based on relatively recent financial accounting data.	Accomplished by compiling financial accounting data for more than 31,000 firms of which about half are in emerging markets. Nearly 12,000 firms in the sample are SMEs, also a comparatively large sample compared to other SME studies in the literature.
2	To determine whether there is a firm size hierarchy in credit access, which is at the heart of the main research question.	Demonstrated there is positive correlation between firm size (based on annual revenues) and credit access (based on dollar value of credit and as a share of firm assets) in most cases and categories (e.g., income level, sectors).
3	To determine whether the strength of the institutional framework for credit allocation plays a role in credit access.	Provided data and scoring of legal and institutional frameworks around the globe and substantiated many premises of institutional theory associating a favorable legal and institutional framework with credit access. However, statistical testing for legal and institutional variables not validated in relation to dependent variables.
4	To address if there is a firm size hierarchy that is also characterized by listed (on stock exchanges) versus unlisted status of firms.	Provided evidence that most firm size correlations hold, but that large-scale unlisted firms also have greater access to credit than smaller firms. Therefore, listed status is not considered as important for large firms. Listed status is uncommon for SMEs. However, the small number of listed SMEs may have an advantage over unlisted SMEs because their higher levels of financial and operational disclosure send positive signals to lenders of firm-level creditworthiness.
5	To address whether there is a firm size hierarchy in credit access that is directly influenced by the presence of tangible fixed assets that can be pledged as collateral, and if these patterns are similar or different in high-income and emerging markets and across sectors.	Demonstrated there is positive correlation between firm size (based on annual revenues) and credit access. However, could not prove this is due to a disproportionate share of tangible fixed assets the larger the firm. Large firms do not always have to pledge assets, or as frequently as do SMEs. Univariate data show that on a relative basis, sample SMEs have higher fixed assets as a share of total assets than originally assumed, and about the same share of total assets as do large-scale firms. While general patterns hold across markets and sectors, there are exceptions which attest to variability depending on the country mix and sector fundamentals.
6	To address whether the strength of the institutional framework for collateral and secured credit plays a role in credit access.	Statistical testing was inconclusive due to insufficient statistical significance and other testing problems associated with these variables in relation to dependent variables. Descriptive data suggest the strength of the legal and institutional framework for collateral is not very influential for large-scale firms, and varies in its importance for SMEs. A strong framework helps SMEs in many markets, but is not sufficient for SME credit access and is less important than financial variables and other factors.
7	To address whether there is a firm size hierarchy in credit monitoring indicators due to the superior capacity of large-scale firms to comply with loan covenants?	Univariate data show that large-scale firms typically have better performance indicators than SMEs, which justifies increased access to credit.

8	To address whether the legal and institutional framework for contract enforcement and insolvency have a favorable impact on smaller firms' ability to access external finance and, increasingly, long-term finance.	Statistical testing inconclusive. Descriptive statistics indicate the strength of the legal and institutional framework for contract enforcement and insolvency is not very influential for large-scale firms, and varies in its importance for SMEs. A strong framework helps SMEs in some markets, but is not sufficient for SME credit access and is less important than financial variables and other factors.
---	---	--

D. Context for Thesis Definitions and SME Characteristics

1. Context for Definitions

There is no standardized or global definition of SMEs despite being a topic of research for decades. From a methodological standpoint, definitions of firm size are ultimately shaped by the measures used, and results vary depending on the variables used (Dang, Li, & Yang, 2018). Therefore, even when comparing markets that have comparable institutions and levels of economic development, there are vastly different definitions and measures used to test for performance and results.

This observation is confirmed by a scan of definitions across the globe that shows considerable variability in definitions,⁶ reflecting economic profiles, levels of development, policy objectives, and differentiation across markets (Beck, 2013; Beck, Demirgüç-Kunt, & Pería, 2011; Ramalho, Vidigal, Gupta, Gregoriou, & Ebrahimi, 2018).⁷ This variability is acknowledged in much of the literature, which typically defines SMEs by head count, revenues and/or assets (OECD, 2005).⁸ The variability of these definitions and ranges demonstrates how non-standardized the study of SMEs and SME finance is.

A summary of predominant characteristics from the literature indicates that SMEs are more often than not characterized by (a) concentrated ownership,⁹ (b) family ownership,¹⁰ (c) youthfulness,¹¹ (d) higher effective tax rates,¹² (e) longer cash conversion cycles,¹³ (f) opaqueness,¹⁴ (g) a desire for bank relationships and trade credit relationships to ease financing constraints,¹⁵ and (h) higher levels of stockpiled cash in good times (and diluted in bad times).¹⁶ The data also show that most SMEs are not listed on stock exchanges, and that those SMEs listed on exchanges are a much smaller fraction of total SMEs than compared with large-scale firms that show a higher level of stock exchange listing around the globe.

Regarding access to finance, one source notes that SMEs account for less than 25%-30% of business loans in several of the world's largest economies¹⁷ (*Financing SMEs and Entrepreneurs*, OECD, 2018). A closer look at credit by firm size following the definition used in this research shows OECD markets have lower levels of SME credit as a share of business loans.¹⁸ While there are exceptions to the predominance of these ranges in OECD countries,¹⁹ in many emerging markets credit access levels for SMEs are lower than in OECD markets. This is particularly true in Latin America, Africa, Central and South Asia, and emerging markets in Europe.

2. Thesis Definition and Presentation of SMEs

In this thesis, firm size is based on revenue measures (Aslan, 2016b; Ben-Nasr, 2016; Cenni, Monferrà, Salotti, Sangiorgi, & Torluccio, 2015; Cole, 2013; Dasilas & Papasyriopoulos, 2015; Daskalakis et al., 2017, 2014; Dewaelheyns & Van Hulle, 2010; Hoyt & Liebenberg, 2011; Rahaman, 2011; Ramalho & da Silva,

2009; Ramalho et al., 2018), not employment or other measures. Categories of firm size are defined as “small” (\$2-\$10 million in annual revenues), “medium” (\$10-\$50 million in annual revenues), and “large” (greater than \$50 million in annual revenues).

SMEs themselves are not homogeneous (Antonelli, Crespi, & Scellato, 2015; Degryse, Goeij, & Kappert, 2012; Ramalho & da Silva, 2009). Therefore, SMEs are presented in a segmented structure to reflect some of the distinctive challenges they face in terms of access to bank credit resulting from their firm-size characteristics (e.g., tangibility, scale of operations, ownership structure, management skill), recognizing there is heterogeneity within each of these segments due to firm-specific characteristics. The research includes income level, region, listed status and sector to show results of hypothesis testing. Annex 2 provides details on how markets, regions and sectors are constituted. In a small number of Level 2 sample cases, “Catch-All” firms are included in some results. These observations apply to firms that cannot be categorized by sector but whose results are still relevant.

E. Global Credit Patterns

Global credit patterns by income level and geographic markets are presented below for high-level context. These data show that access to credit is most common in North America and Asia-Pacific (including emerging market Asia-Pacific), while high-income European firms lag despite their financial systems largely being “bank-based”. Apart from Asia-Pacific, emerging markets are well below high-income market averages and global averages. Therefore, global averages are highly influenced by a few concentrated areas of economic power, attesting to significant regional differences in GDP and credit allocation that mirror many income distribution disparities across the globe.

Relative to global averages (means), regional markets covered by the research show most economic power and credit to be in North America, high-income and emerging market Asia-Pacific, and high-income Europe. Together, these four groupings account for 77% of global GDP and 91% of global domestic credit. Asia-Pacific and North America have the most active domestic credit markets relative to GDP and in absolute values.

Table 3 summarizes the high-level data and regional market patterns described above. Subsequent analysis shows where SMEs fit into this global picture. In general, the research shows that SMEs are a small share of domestic credit, and that large-scale firms account for most credit allocation, confirming most firm size biases in the hypotheses discussed in the main text.

Table 3: Global Context for Credit Allocation

This table presents GDP, domestic and per capita income data by geographic region. Panel (1) present dollar values for GDP, domestic credit and incomes for each region of the research. Column (1) presents GDP in billions of dollars. Column (2) presents domestic credit as a share of GDP by region. Column (3) presents domestic credit in billions of dollars. Column (4) presents population millions of persons. Column (5) presents per capita incomes in actual dollars. Panel (2) reports the same figures in Panel (1) in relation to global averages to reflect each region's global share or relation to global averages. *Source Data:* GDP and Domestic Credit are from World Bank (2017 or latest year available at the time of data collection); Domestic Credit/GDP = Domestic Credit Provided by Financial Sector as a share of GDP, mainly from IMF (sourced from World Bank World Development Indicators; 2017 or latest available).

Panel 1: Region-specific Data for GDP, Credit and Incomes					
	(1) GDP	(2) Domestic Credit/GDP	(3) Domestic Credit	(4) Population	(5) Per Capita Incomes
AFRICA	2,261	65%	1,469	1,255	1,802
CARIBBEAN	69	49%	34	17	4,126
CENTRAL ASIA	265	26%	69	71	3,719
EM ASIA PACIFIC	15,652	194%	30,392	2,047	7,647
EM EUROPE	3,400	58%	1,976	348	9,765
HI ASIA PACIFIC	8,256	277%	22,851	213	38,707
HI EUROPE	16,894	155%	26,145	422	40,015
LATIN AMERICA	5,506	74%	4,070	624	8,822
MIDDLE EAST	3,436	74%	2,551	326	10,553
SOUTH ASIA	3,361	71%	2,388	1,842	1,825
USA/CANADA	21,044	244%	51,308	362	58,067
Total	80,144	179%	143,253	7,527	10,647
Panel 2: Global Shares or Relation to Global Means for GDP, Credit and Incomes					
	(1) % of Global GDP	(2) Avg. Domestic Credit/GDP	(3) % of Global Domestic Credit	(4) % of Global Population	(5) Per Capita Incomes to Global Mean
AFRICA	3%	36%	1%	17%	17%
CARIBBEAN	0%	28%	0%	0%	39%
CENTRAL ASIA	0%	15%	0%	1%	35%
EM ASIA PACIFIC	20%	109%	21%	27%	72%
EM EUROPE	4%	33%	1%	5%	92%
HI ASIA PACIFIC	10%	155%	16%	3%	364%
HI EUROPE	21%	87%	18%	6%	376%
LATIN AMERICA	7%	41%	3%	8%	83%
MIDDLE EAST	4%	42%	2%	4%	99%
SOUTH ASIA	4%	40%	2%	24%	17%
USA/CANADA	26%	136%	36%	5%	545%

F. Structure of the Thesis

The balance of this thesis (1) reviews the literature, and provides a conceptual framework, including hypothesis development (Section 2), (2) describes the data and methodology, including selection of variables for econometric specifications (Section 3), (3) illustrates firm size patterns in relation to the dependent variables underlying the main research premise (Section 4), and presents results of robustness tests (Sections 5-6), and then (4) presents the main observations, findings and conclusions (Sections 7-8).

The Findings and Observations (Section 7) also highlight potential future research that can be undertaken to address some of the limitations of the thesis while Conclusions (Section 8) present basic policy implications from research results.

II. Literature Review and Conceptual Framework

A. Background

Thousands of journal articles and policy notes have been written over the decades on the role of small and medium-sized enterprises (SMEs), their general importance to the economy, and the challenges they have often faced in being able to access finance and grow. One source estimates that more than 95% of firms are SMEs and more than half of employees work in companies with fewer than 100 employees (Beck, 2013). A rough estimate of 50-75 million businesses with annual sales exceeding \$2 million is about 1,000 times the number of companies listed on stock exchanges around the world.²⁰ Therefore, the prominent role of SMEs in national and regional economies is broadly acknowledged.

In general, the literature assumes that SMEs are financially constrained despite SMEs having higher growth rates than larger companies (Rahaman, 2011). However, other research has noted that financial constraints may not be as severe as are typically assumed (Torre et al., 2010), at least where there is a high level of SME concentration (Canton, Grilo, Monteagudo, & van der Zwan, 2013), where there is banking competition (Canales & Nanda, 2012; Chong et al., 2013), and during “normal” non-crisis periods of comparative stability (Berger, Cerqueiro, & Penas, 2015). Some note that SME growth is not proportional to firm size (Bentzen et al., 2012), thereby rejecting the claim that SMEs automatically have higher growth rates. Others go as far as noting that the comparative productivity advantages of larger firms raise questions about whether the financial markets should be providing as much lending to smaller firms as they do, at least in the case of Italy and other “periphery countries” of Europe where markets are “incomplete” (Hassan, Mauro, & Ottaviano, 2017). Yet another study is more agnostic on firm size and growth rates and claims that economic benefits as a whole will improve if lenders provide more credit to enterprises in general and less to households (Büyükkarabacak & Valev, 2010), implying that productivity gaps and financing constraints for SMEs are broadly inter-related.

The approach taken by the thesis is that there are multiple explanations that reflect these challenges due to the variety of factors and markets involved. From the *supply side*, external institutional sources of financing (e.g., banks, non-bank financial institutions, equity investors) face their own constraints (e.g., market limitations, risk appetite, regulatory boundaries, portfolio preferences) which impacts the allocation of loan and investment resources. Therefore, they may be missing out on opportunities to increase earnings and/or market share, sometimes justifiably and other times mistakenly. From the *demand side*, some companies are well managed and should be able to access more external financing for longer periods at lower cost and under more accommodating conditions, while others could do much more to improve their creditworthiness to increase their prospects for external financing. Therefore, SME access to finance is often determined by the capacity and structure of management teams, not just financial or operational fundamentals.

1. *Supply Side Considerations for SME Access to Finance*

Much of the literature focuses on supply side aspects of SME financing. *Ex-ante* credit decision making (screening, adverse selection) versus *ex-post* credit management (performance monitoring, borrower moral hazard) considerations permeate the discussion of credit extension, risk management, and how capital providers determine whether to provide credit to SMEs and under what conditions. This has

culminated in a large volume of literature on (a) types of banking systems and how they provide and manage credit to SMEs, (b) “relationship-oriented” versus “transaction-oriented” systems and models, (c) the use of “hard” and “soft” information, and (d) the relevance of scale, distance, organizational structure and information technologies.

Seminal works focused on (a) the nature of the firm (Coase, 1937) and transactions (Williamson, 2008), (b) separation of ownership from control (Berle and Means, 1932), (c) agency theory (Fama, 1999; Fama & Jensen, 1983; Jensen & Meckling, 1976), and (d) the importance of governance and legal systems (Porta & Lopez-de-silanes, 1999; Shleifer et al., 2012) in the general management of resources and risk are well known and not repeated here. In brief, these are overarching theories and contributions that continue to be relevant to SMEs and firms in general in their capacity to properly manage themselves internally and, where relevant, externally (Acharya, Myers, & Rajan, 2011). By extension, such literature is relevant to SME capacity to operate and thrive in a competitive global environment. To the extent that SMEs seek external finance (Myers, 1977, 1983; Myers & Majluf, 1984), such seminal works are also important in relation to the ability of SMEs to enhance their creditworthiness so that they can access needed financing in sufficient amounts, for sufficient periods (maturities), and at rates that will not undermine their ability to generate incremental cash flows.

Estimates of the cost of debt show that *ex-ante* costs can be as much as half the total cost when accounting for default risk (probability of default, or PD, and loss given default, or LGD) for listed firms (Binsbergen, Graham, & Yang, 2010). For SMEs, such costs may be greater due to the lack of collateral that can be pledged and/or lender biases against smaller firms when they exist. Based on the research, estimates of listed firms’ *ex-post* costs of bankruptcy typically range from 3% to 5% of firm value, although these estimates often involve only direct costs. This translates into cost of default estimates of about half of the total costs of debt, which also means *ex-ante* default risk costs vary from 4% to 6% for investment grade listed firms and 9% to 17% for sub-investment grade listed firms, depending on models used (Binsbergen et al., 2010). As SMEs are typically unlisted and unrated, it is reasonable to assume that lenders would estimate default risk for SMEs to be in the 10% to 20% range of firm value (based on shareholder equity and any proxy lenders might subsequently use to adjust this book value), and that such costs could be half of total debt costs.

As an example, the assumption above that SME default risk is in the 10% to 20% range of book value (Binsbergen et al., 2010). While the absolute dollar value of the loan exposure is lower, which limits the maximum loss that could occur for the lender, the example also shows there is an intrinsic constraint on potential earnings from such transactions for lenders. On a per unit basis (e.g., \$1 of loan principal), there is an inherent increase in the cost due to the higher estimate of default and bankruptcy, automatically reducing the earnings margin to the lender unless the interest rate is raised to offset this risk. Beyond that, there is a higher operating cost for the lender on a per unit basis as fixed costs of loan origination are spread over a smaller amount of loan principal. These economic fundamentals work against small-scale firms when seeking loans.

Such fundamentals also reflect the supply and demand side frictions at play in the pecking order literature (Myers, 1977, 1983; Myers & Majluf, 1984). Small-scale firms typically have less borrowing power in the market as they are smaller and have less in the way of assets to pledge as collateral. This limits their

attractiveness to lenders due to SMEs' lower levels of revenue and cash flow backed by less in the way of pledged assets, and translates into higher estimated per unit costs to lenders of approving loans to smaller borrowers.

What is commonly reported is that SMEs are considered more opaque than large-scale listed firms, and they have less in tangible assets to collateralize. These two factors alone add to the financing challenge for SMEs in addition to any incremental risk premium resulting from the perceived higher risk of default. This puts the onus on SMEs to be able to properly present useful information to capital providers to reduce information asymmetry so capital providers can better estimate PD and LGD for these SMEs. This is a key lesson for SMEs that do seek external financing. In effect, the onus is on SMEs to be less opaque (a) to be able to access needed financing, and (b) to reduce the *ex-ante* premium associated with asymmetric information.

Meanwhile, lenders emphasizing relationship lending need to have strong risk management systems in place to ensure personal and historical biases do not weaken performance and asset quality. In many markets with weaker institutional environments, asset quality is sometimes diminished by non-commercial or politically directed decision making.²¹ As many small banks assign territories to managers/officers, as opposed to organizing along industry specialization lines, sound credit decision making systems are needed to complement relationships and reliance on soft information. These forms of credit discipline may add to challenges for SMEs in accessing external finance.

2. *Opportunities for SMEs to Access Credit*

Despite these challenges, the hurdles are not insurmountable for SMEs. In some cases, the smaller size of a firm may be an advantage, as some lending institutions focus specifically on smaller firms. This relates back to the type of business orientation, customer focus and lending culture espoused by the lending institution. As noted above, SMEs are typically less complex than listed companies due to their smaller size, making it easier for lenders to manage SME exposure risk. This provides an opportunity to better understand the borrower's business itself when compared to many other larger companies, particularly large firms that are (a) diversified across product/business lines, (b) sprawling across markets, (c) heavily reliant on a broad range of technologies and proprietary rights, and (d) major users of outsourcing. Examples of techniques that can be used by lenders to manage exposure risk to SME borrowers include (a) discounting accruals (Ball, Gerakos, Linnainmaa, & Nikolaev, 2016a) and other financial accounting information like increased receivables or decreasing depreciation expenses (Beneish, Lee, & Nichols, 2013), (b) setting limits on amounts of credit and the length of maturity through covenants (Prilmeier, 2017b), (c) requiring collateral and/or guarantees (Beck, 2013; Chiou & Shu, 2017; Godlewski & Weill, 2011), and (d) gradually easing these constraints²² over time as warranted by longstanding relationships based on a track record of payment performance by the SME borrower (Cenni et al., 2015). The chances of SMEs accessing financing are also enhanced with banks when they utilize other fee-generating services (e.g., payroll, guarantees) that are cross-sold by banks, and with trade creditors when this strengthens supply chain relationships.

Underpinning the mediation of frictions between borrowers and creditors are relationships, bonds of trust, and "local knowledge" that are often (a) intangible, (b) character- or reputation-based, and (c) not

always effectively “scored” by hard systems. For transaction-based lenders, models may exclude potentially good borrowers, creating an opportunity cost to the lender, although such exclusion may also reduce credit risk in the bank’s portfolio and operational risk due to cost efficiencies resulting from the bank’s automated systems. Meanwhile, relationship lending has its downside, as in some cases too close a relationship may result in conflict of interest that culminates in bank losses. Notwithstanding these risks, there is broad consensus that “soft” information not captured in automated credit scoring systems is useful and potentially valuable in credit decision making.²³ Banks and others continue to improve their credit scoring systems, and many now utilize tools from market research, data analysis (e.g., patterns) and artificial intelligence to include such information into their otherwise “hard” information systems. Advancements in data analytics and new technologies are already making markets, financial institutions and companies more competitive. Adaptation of such tools can increase opportunities for SMEs to align financial and other reporting systems with data and information needed by lenders to be able to increase their chances of accessing needed financing.

Therefore, another factor that can potentially favor SME access to credit is the advancing role of automation and technology in financial intermediation.²⁴ A considerable number of articles have highlighted the role of “hard” information and prevalence in some markets of “transaction banking” models as opposed to “relationship banking”. Even banks that have focused on relationship lending and greater use of “soft” information have developed and adopted credit scoring systems that have automated some of the credit risk evaluation function. Support vector machines for SME default prediction have also been introduced and adapted to financial accounting analysis (unsecured), asset valuation (secured) and credit scoring as well as for the maintenance of loan files and borrower information to sustain relationships in the face of loan officer turnover (Kim & Sohn, 2010).

As systems have become more developed to model risk from “hard” information, the onus is now on SMEs to provide the kind of information required to fit within those decision-making systems and tools. This relates back to the issue of information asymmetry and risk of adverse selection for creditors. A key lesson for SMEs is that they can strengthen their disclosure and accountability profile with better information and risk management systems, including financial risk management. However, these are typically not as developed in SMEs as they are in larger companies, further constraining SME prospects for access to external finance.

3. Collateral Framework Issues and Constraints for SMEs

SMEs have traditionally faced financing challenges from banks or other creditors due to their lack of fixed assets. Lenders have typically secured their SME loans, most commonly when extending long-term loans, with most collateral being in the form of fixed assets (i.e., property, plant, equipment). Even here, SMEs are perceived to face obstacles, as weaknesses in the collateral framework for moveable assets (i.e., machinery and equipment) create a bias in secured lending flows to firms with immovable property as opposed to those with predominantly moveable assets. According to one source, moveable assets account for 78% of total assets in emerging markets (Campa, 2011) when this includes inventories as well as machinery and equipment, but lending is often directed more to property and plant (immovable assets) when secured loans are made. Hence, the intrinsic bias in lending patterns towards larger firms with a larger share of immovable assets on their balance sheets. As SMEs often lack these assets, this

contributes to reticence on the part of banks to lend to SMEs, at least on anything but a short-term basis. Even where the collateral framework is sound, SMEs sometimes find it difficult to access long-term financing, even in economies with more developed credit and financial markets (*Financing SMEs and Entrepreneurs, OECD, 2018*).

Specific to current operations, inventories, receivables and other short-term assets serve as collateral on working capital lines of credit that are short-term or for loans that offer continuous rollover financing to help firms manage their liquidity. However, this financing is tied up in daily operations, and cannot always be leveraged by SMEs. Therefore, greater fixed or tangible assets help SMEs access finance (Campello & Hackbarth, 2012).

Many SMEs have limited fixed assets, and these figures and ratios would become even more apparent if the thesis sample were enlarged to include firms with annual revenues of \$1-\$2 million.²⁵ For the fixed assets many small firms do have, they are often in machinery and equipment that are harder to pledge as collateral for loans and/or are more deeply discounted in value than immoveable fixed assets (i.e., property, plant), thereby reducing the degree of loan financing that can be obtained, particularly in emerging markets (Calomiris et al., 2017a). For firms with low levels of tangible fixed assets, the challenges in accessing loan finance are significant, particularly long-term loans.

The problem of collateral is even more challenging for firms with little or no tangible assets. In recent decades, many “innovative” firms in knowledge-based industries with considerable investment in intangible assets (e.g., intellectual property) have found that conventional lenders are unwilling or even unable to provide credit (Beck, De Jonghe, et al., 2013; Berkowitz et al., 2015). Therefore, SMEs with mainly intangible assets have a harder time accessing credit, including trade credit (Fabbri & Menichini, 2010). This is true in advanced economies, and even more challenging in many emerging markets where immoveable assets are often the only assets that can be pledged as collateral for a loan (J. Z. Chen et al., 2013). Given how few markets have viable venture capital and angel financing, the challenge extends to equity markets as well as unconventional financing markets. For instance, Islamic finance typically finances tangible goods and related distribution/trade, not intangible assets (Beck, Demirgüç-Kunt, & Merrouche, 2013). The issue of intangible assets and financing for knowledge-based industries and related “innovative” firms is a topic that deserves greater study, although there is already considerable literature available that deals with these themes.

4. *Exogenous Challenges and Constraints for SMEs*

As with all other firms, SMEs are affected by exogenous factors while having to manage endogenous factors to compete in the market. Macroeconomic factors (e.g., GDP growth, inflation rates, price stability, exchange rates, fiscal balances, debt structure), legal and institutional structures and other factors influence markets such as industry concentration and pricing power (Datta, Iskandar-Datta, & Sharma, 2011). When banks tighten credit flows following (or in anticipation of) changes in the macroeconomic, prudential and/or business environment, there are spillovers in both bank credit and trade credit, all of which shift the power balance between SMEs on the one hand and capital providers on the other. The latter can be providers of bank credit, trade credit or any other form of financing.

The mix of macroeconomic, country and related trade and financing characteristics fuses with endogenous variables (e.g., firm-specific, debt maturity) to influence financing patterns (Daskalakis et al., 2017). Shocks have an adverse effect on bank credit supply, with particularly adverse direct effects on bank-dependent borrowers that can then shift the dynamics of the trade credit market (Chava & Purnanandam, 2011) as well as banking markets. Political risk also has a major impact on the investment climate and, by extension, the cost of equity and debt, which can therefore influence the general pattern of market development (Bekaert, Harvey, Lundblad, & Siegel, 2016; Belkhir, Boubakri, & Grira, 2017; Gungoraydinoglu, Çolak, & Öztekin, 2017).

In response, more than one study has highlighted advantages that smaller firms have regarding capacity to adapt to exogenous shocks and changes (Álvarez & Vergara, 2013) as opposed to larger firms that are often more bureaucratic and less nimble. However, this is case-specific, as many others have highlighted the risk of default due to exogenous shocks and how firm size is a key factor in resilience and capacity to survive adverse shocks (Chi & Su, 2017; Daskalakis et al., 2014; Fitzpatrick & Ogden, 2011; González, 2013a), in these cases often providing an advantage to larger firms when compared with smaller firms.

B. Credit Decision Making Considerations

1. *Firm Size and Credit Access*

Benefits and costs of leverage have been examined for decades (Korteweg, 2010), and have mainly focused on large listed firms. Likewise, in terms of financing preferences when firms have choice, much of the literature has focused on the pecking order or trade-off theories as they apply to larger (and often listed) firms. SMEs often lack the tangible fixed assets to access external finance, rendering pecking order preferences a luxury beyond internal financing possibilities. This extends to trade-off theory, where SMEs often do not have external finance options to optimize capital structure.

In fact, these challenges even extend to some listed firms on liquid exchanges, described as part of the “low leverage puzzle”. This theory shows that comparatively small listed companies typically have no more than 5% of their asset value in debt, with debt frequently at zero (D’Mello & Gruskin, 2014), compared to much larger listed firms with debt levels at much higher percentages of assets, reflecting the ability of the largest listed firms to leverage their assets more than other listed firms. To be clear, the smaller listed firms are not small-scale firms. Rather, they are “large” based on firm size definitions used in the research, with annual revenues typically exceeding \$50 million. However, compared with the largest firms listed on global stock exchanges, they are comparatively small when the sample is restricted to listed firms.

While this pattern may partly reflect the pecking order theory and a firm preference to restrict external financing (Myers, 1983; Myers & Majluf, 1984), the trend shows a firm size bias may be in effect among large-scale listed firms, with the largest dominating credit markets and smaller listed firms having less access. From 1977 to 2010, the share of firms with less than 5% debt in their capital structures increased from 14% to more than 34%, and the percentage of all-equity firms increased 200%. However, aggregate private sector credit (debt financing) grew during the same period, with an increasing share going to large-scale firms (D’Mello & Gruskin, 2014). This suggests that larger firms have increased their overall amount of borrowing in total and on average, while smaller firms have seen the opposite trend and, in many cases,

may be financially constrained (Devos, Dhillon, Jagannathan, & Krishnamurthy, 2012). As this challenge applies to listed firms that are “large” (e.g., greater than \$50 million in annual revenues) when compared with SMEs, it is almost axiomatic that SMEs would face external financing challenges that are compounded by cost considerations (Dietrich, 2012) as well as access, particularly when credit conditions tighten (Drakos, 2013).

For SMEs, the benefits of leverage are not always the same as they are for larger firms. For instance, large-scale firms typically factor in tax shields as part of their strategy in determining financing methods and instruments, whereas these tax shields are less useful to SMEs due to their lower levels of profitability (Mac an Bhaird & Lucey, 2010). Therefore, there is a distinctiveness to SME financing that separates it from larger firms. Given the predominance of SMEs and microenterprises globally, developing a better profile of these financing needs and preferences is essential for a better understanding of global markets and in emerging markets where research and data have been less prominent in the corporate finance literature.

While emerging markets research has figured less prominently in corporate finance, it nonetheless has increased as markets have become more globalized in recent decades. Research in India has found that greater financial development is associated with higher rates of small business entry into the market, while continuing to play a sustaining role for continued financing as firms grow even if their level of dependence on external finance diminishes on a relative basis (Ayyagari, Demirgüç-kunt, & Maksimovic, 2018). Other markets such as the European Union show that the youngest and smallest firms have the greatest perceived difficulty in accessing bank loans, particularly in markets where there is considerable competition and limited foreign bank presence (Canton et al., 2013). This has a major economic impact when considering that SMEs account for more than 99% of all EU enterprises (Filipe, Grammatikos, & Michala, 2016), two thirds of real sector EU employment (Daskalakis et al., 2014), and about half of all manufacturing jobs in the world (Torre et al., 2010). In other markets covering transition countries of Europe (nine of which are now members of the European Union) and the former Soviet Union, access to credit is affected by a mix of factors that include firm size, profitability, sales growth, ownership type, legal status, sector specificity, and domestic credit (Drakos & Giannakopoulos, 2011). Therefore, patterns are variable across countries, regions and sectors.

The observation that constraints on external financing hinder firm-level growth are longstanding (Demirgüç-Kunt & Maksimovic, 1998; Rajan & Zingales, 1998). While some of the research has focused on emerging markets (Ağca, De Nicolò, & Detragiache, 2013; Ayyagari et al., 2018; Belkhir et al., 2016a), most of the research on SME financing constraints has focused on high-income markets (Andrieu, Staglianò, & van der Zwan, 2018; Cenni et al., 2015; Guida & Sabato, 2017a; Hernández-cánovas & Koëter-kant, 2011; Jõeveer, 2013) and/or on a country-specific basis in high-income markets (Aslan, 2016a; Belke, 2013; Cole, 2013; Dasilas & Papasyriopoulos, 2015; Dewaelheyns & Van Hulle, 2010; Gupta, Bunkanwanicha, Khakimov, & Spieser, 2016; Mac an Bhaird & Lucey, 2010; Moro, Fink, & Maresch, 2015; Nordal & Næs, 2012; Ramalho & da Silva, 2009; Van Caneghem & Van Campenhout, 2012). Even when the research has focused on emerging markets, data are sometimes old, limited by small samples, and/or are country-specific (Bee & Abdollahi, 2013; Behr & Sonnekalb, 2012; Köksal & Orman, 2014). Meanwhile, in many if

not most cases, firm size definitions have been based on employment levels rather than financial measures (Andrieu et al., 2018; Canton et al., 2013; Hernández-cánovas & Koëter-kant, 2011).

The inability of many financially constrained firms to access credit (or to only access short-term credit and/or lesser amounts due to cost) can also have the effect of foregone total factor productivity to economies as greater access to financing allows these constrained firms to invest in productive projects that are otherwise not undertaken (Chemmanur, Krishnan, & Nandy, 2014; Krishnan, Nandy, & Puri, 2015). Some research in this stream claims this is not firm size-dependent, but dependent on other characteristics such as liquidity and degrees of innovation and R&D (Antonelli et al., 2015; De & Nagaraj, 2014), although other research suggests that excess focus on lending to SMEs can also diminish total factor productivity through sub-optimal allocation of bank lending resources to SMEs (Hassan et al., 2017). More broadly, intra-industry heterogeneity in markets among SMEs and others suggests that degrees of competition, agency conflicts and technologies employed are important in relation to small firms' capital structure (Degryse et al., 2012) and total factor productivity in the economy. Overall SME access and cost is also directly influenced by macroeconomic (Ipinnaiye, Dineen, & Lenihan, 2017) and country-specific (sovereign) risks (Drakos, 2013), suggesting cross-sectional heterogeneity in regional markets also plays a critical role in determining access to and price of credit. These observations result in the following hypothesis:

H1: If firms are comparatively large, then they will have greater credit access than smaller firms as a share of firm-level assets. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.

2. Legal and Institutional Framework for Credit Access

The profile of credit access by country and region triggers questions about the legal and institutional framework in those countries/regions. Broadly, a stronger institutional framework encourages banks to take on more risk (Houston et al., 2010) and for firms to borrow (Belkhir et al., 2016a) within prudent bounds (An et al., 2016), although borrowings can clearly become excessive and undermine total factor productivity if not properly managed (Coricelli et al., 2012; Korteweg, 2010). There is substantial literature addressing the importance of creditor rights and contract enforcement (Favara, Morellec, Schroth, & Valta, 2017; Öztekin, 2015) in relation to financial performance and leverage of firms (González, 2013a), as well as broader capacity of systems to attract foreign investment irrespective of regulatory differences and comparative laxity (Houston, Lin, & Ma, 2012). The ability of creditors to access useful information for better credit risk assessment (Ball, Gerakos, Linnainmaa, & Nikolaev, 2016b, 2015; Behr & Sonnekalb, 2012; Dichev, Graham, & Harvey, 2017; Van Caneghem & Van Campenhout, 2012; Vander Bauwhede, De Meyere, & Van Cauwenberge, 2015) is a precondition for credit allocation to private businesses. Overall levels of financial sector development as measured by both strength and structure (Demirgüç-kunt, Laeven, Levine, Money, & Part, 2004; Demirgüç-Kunt & Maksimovic, 1998) are also needed to sustain entry and growth (Bena & Ondko, 2012). This may be even more essential in emerging markets characterized by bank-based systems, weak legal and institutional frameworks, and limited capital markets (I. Kim, Miller, Wan, & Wang, 2016; Ullah, 2016). In sum, a stronger legal and institutional

environment helps to contain firm-specific risks (Hernández-Cánovas & Koëter-Kant, 2010), enabling bank lending that would otherwise not occur in a weak environment.

These considerations are directly related to *the supply side* of financial markets and the resulting impact on credit allocation. Banking market reforms and institutional strength lead to optimization in the supply, pricing and allocation of credit (Houston et al., 2012) due to improved risk management and tightened lending standards, resulting in more efficient allocations that also shift supply to firms that were previously more credit-constrained (Ağca et al., 2013). Relationships influence lending patterns by reducing asymmetric information (Yunhao Chen, Jiang, & Lee, 2015a; Moro et al., 2015), generating both benefits and costs to borrowers (Aslan, 2016b), but with varied outcomes depending on firm size and length of relationship (Cenni et al., 2015) that also vary according to degrees of competition, concentration and foreign investment in banking systems (Beck et al., 2011; Canton et al., 2013). Such relationships can also extend to other non-lending activities that, due to cross-selling, can strengthen borrower operations by leveraging bank services (Santikian, 2014; Torre et al., 2010). “Distance” also shows varied outcomes and patterns (Cenni et al., 2015; Chen, 2016) when accounting for closeness, exclusivity and the types of information used by lenders to assess borrower creditworthiness (Guida & Sabato, 2017a), and by type of lender (e.g., bank and non-bank), although these studies do not typically break out results by loan maturity (Han, 2018).

Better *ex-ante* credit information via credit registries/bureaus may not affect access, but may improve lenders’ loan quality (Behr & Sonnekalb, 2012) due to improvements in lender default predictions (Dierkes, Erner, Langer, & Norden, 2013), while detailed financial accounts provided by SME borrowers are positively related to credit access (Van Caneghem & Van Campenhout, 2012) and associated interest expense (Vander Bauwhede et al., 2015). More broadly, better institutional environments reduce information asymmetry and debt costs (Gao & Zhu, 2015; Öztekin, 2015) which are viewed in some markets as the common underlying factor in accessing external financing (Mac an Bhaird & Lucey, 2010), resulting in a bias towards firms with tangible fixed assets that can serve as collateral and reduce risks to lenders of information asymmetries. These institutional factors are included in the examination of credit access and serve to influence results of hypothesis testing. These observations result in the following hypothesis:

H2: If firms operate in markets with more available credit information, stronger protection of minority shareholder rights, and greater regulatory effectiveness, then they will have higher levels of credit access than firms in markets with weaker laws and institutions. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.

3. *Listed Status and Credit Access*

Rahaman (2011) finds that the effects of access to external finance on firm growth are particularly pronounced for small-scale (i.e., less than 100 employees) unlisted firms. This is partly confirmed by the literature that reports comparable leverage ratios between privately-held firms and “low-cap” publicly-traded firms (in the U.S.), but with SMEs showing greater dependency on trade credit due to challenges accessing bank credit (Cole, 2013).

Research focused on SMEs that are listed on the Athens Stock Exchange in Greece shows SMEs' debt prospects are most sensitive to growth opportunities and credit ratings, as opposed to large-scale listed firms whose capital structures are more affected by tangible assets and non-debt tax shields (Dasilas & Papasyriopoulos, 2015). This relationship of firm size and tangibility in Greece was likewise confirmed across 10 other high-income EU countries, indicating robustness for large-scale listed firms, but not for small-scale listed firms that appear to face non-firm-specific obstacles in capital structure choice due to country of incorporation information issues that are not faced by large listed firms (Jöeveer, 2013).

Meanwhile, for listed firms, the quality and precision of public information disclosure can have beneficial effects on a firm's cost of capital, but this is also dependent on threshold growth rates and the persistence of cash flows compared to other firms in the economy (Dutta & Nezlobin, 2017). In markets where financial disclosures may be murky, such as in China, listed firms of all sizes that disclose useful working capital information and demonstrate efficient working capital management practices can help with analyst coverage and forecasts of future earnings (Gao & Wang, 2017) which can favorably impact access to credit and reduce its cost (Gao & Zhu, 2015). Meanwhile, tangible collateral and the ability of lenders to enforce contracts in the event of weakened borrower performance are commonly identified as necessary to reduce lender concerns about information opaqueness (Mac an Bhaird & Lucey, 2011). These observations result in the following hypothesis:

H3: If firms are listed on a stock exchange, then they will have greater access to credit than unlisted firms. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.

C. The Role of Collateral and Secured Transactions

1. Tangible Fixed Assets and Credit Access

SMEs have traditionally faced financing challenges from banks or other creditors partly due to their comparative lack of tangible fixed assets (Crespo-espert, 2010; Love et al., 2016). In emerging markets, this has often been exacerbated by the inability of firms to pledge immovable assets in a secure legal and institutional framework (Hall, 2012b; Yaldiz Hanedar et al., 2014). Banks and other lenders typically secure their SME loans, most commonly when extending long-term loans, with most collateral being in the form of fixed assets (i.e., property, plant, equipment). As highly regulated institutions, deposit-taking banks typically have a lower risk appetite than investment-oriented non-bank financial institutions. In this regard, their risk appetite is biased towards fixed, tangible and liquid assets as sources of collateral for loans (Campello & Hackbarth, 2012).

Even here, SMEs are perceived to face obstacles, as weaknesses in the collateral framework for moveable assets (i.e., machinery and equipment) create a bias in secured lending flows to firms with immovable property as opposed to those with predominantly moveable assets. According to one source (Campa, 2011), moveable assets (including inventories) account for 78% of total assets in emerging markets, but lending is directed more to property and plant (immovable assets) when secured loans are made (Calomiris et al., 2017a). Hence, the intrinsic bias in lending patterns towards larger firms with a larger share of immovable assets on their balance sheets. As SMEs often lack these assets (Love et al., 2016), this contributes to reticence on the part of banks to lend to SMEs, at least on anything but a short-term

basis. Even where the collateral framework is sound, SMEs sometimes find it difficult to access long-term financing, even in economies with more developed credit and financial markets (*Financing SMEs and Entrepreneurs, OECD, 2018*).

Specific to current business operations, short-term assets like inventories and receivables serve as collateral on working capital lines of credit that are short-term or for loans that offer continuous rollover financing to help firms manage their liquidity. However, this financing is tied up in daily operations, and cannot always be leveraged by SMEs. Moreover, such working capital assets are less important as drivers of collateral use by firms than PPE (Norden & van Kampen, 2013). Therefore, greater fixed or tangible assets help SMEs access finance (Campello & Hackbarth, 2012) because of their value and long-term depreciation schedules.

The role of disclosure as a means of signaling confidence and potentially greater creditworthiness is a factor as not all SMEs lack tangible fixed assets. Firms that voluntarily disclose their financial accounting information are perceived to be stronger firms as a result of signals associated with this disclosure (Berger et al., 2016; Godlewski & Weill, 2011; Uchida, 2011). Such firms are frequently able to leverage tangible fixed assets (even if not substantial in value) at a far higher rate than SMEs that do not follow disclosure practices that provide lenders with confidence in the accounting data that can be readily employed in loan covenants (Chen et al., 2013) for lower cost and/or more timely *ex-post* monitoring (Berger et al., 2016). This applies broadly to operations as well as how firms have been able to accumulate and maintain their tangible fixed assets that are pledged as collateral for loans. Therefore, such signals go beyond accounting disclosures and relate to the willingness and ability of firms to pledge assets as collateral as an indicator of borrower risk, as well as preferences of the borrower in relation to access and pricing of bank loans (Berger et al., 2011; Niinimäki, 2011). In this regard, firms demonstrating a willingness to pledge assets convey strength, which should increase access to bank credit under more favorable terms. This would be particularly beneficial to younger firms, for firms without longstanding banking relationships, and for firms operating in markets lacking credit information bureaus or other sources of credit risk-related information.

Even when SMEs have assets to pledge, the legal framework may reinforce a bias in favor of property and plant, as opposed to machinery and equipment. Some research has noted that many legal frameworks are adequate for securing immovable properties, but not so for moveable assets (Calomiris et al., 2017a; Chen et al., 2013). One study comparing seven different emerging markets has demonstrated that the establishment of moveable property registries leads to a 10% increase in the number of firms with access to bank credit, particularly for smaller and younger firms, and that the benefits include lower rates and longer maturities (Love et al., 2016). As one example of a market where moveable assets cannot be used as collateral (China, as in other markets), restrictions on collateral and interest rates mean conservative reporting of financial accounting data is important as a condition for accessing credit (Yehning Chen, Huang, Tsai, & Tzeng, 2013). However, it also means less of a range of collateral is available, reducing tools for lenders to more efficiently allocate resources. While not discussed in the literature, the emphasis on immovable properties as collateral may have contributed to over-building and pricing bubbles in some commercial real estate markets. Meanwhile, for immovable properties, land transferability is sometimes

used as a proxy for collateral in relation to leverage (Hall, 2012b), with leverage ratios (debt access) heavily influenced by the degree to which firms can trade or pledge land.

For the tangible fixed assets many small firms do have, they are often in machinery and equipment that are harder to pledge as collateral for loans and/or are more deeply discounted in value than immoveable fixed assets (i.e., property, plant), thereby reducing the degree of loan financing that can be obtained, particularly in emerging markets (Calomiris et al., 2017a). For firms with low levels of tangible fixed assets (in dollar value), challenges in accessing loan finance are significant, particularly for long-term loans. Moreover, if the distribution of tangible fixed assets between immoveable and moveable fixed assets shows positive correlation in firm size with immoveable assets and negative correlation in firm size and moveable assets, smaller firms will face greater difficulties accessing credit (particularly long-term credit) as their share of moveable assets to total tangible fixed assets is higher than it is for larger firms.

In sum, many if not most SMEs have limited tangible fixed assets. The firm size relationship with tangible fixed assets is mainly one of dollar value, rather than as a share of total assets by firm size. This observation results in the following hypothesis:

H4: If firms are comparatively large, then they will have a higher dollar value of tangible fixed assets that can be pledged to secure loans when compared to smaller firms, resulting in higher levels of credit access in all markets (high-income and emerging) and sectors. This extends as well to long-term credit access in all markets (high-income and emerging) and sectors.

2. Legal and Institutional Framework for Collateral and Credit Access

The profile of credit access by country and region and the role played by tangible fixed assets triggers questions about the legal and institutional framework in those countries/regions. The general framework for property rights is important in this regard (Berkowitz et al., 2015), including institutional mechanisms for legal implementation with clearly specified ownership rights. Strong property rights increase firm value, collateral values, the willingness of creditors to lend, and the willingness of firms to reinvest their profits. Such a virtuous circle particularly benefits firms with tangible assets and those that lack political connections. These benefits tied to the collateral framework also bring down collateral spreads and intensity (e.g., amount of collateral required), and increase the variety of assets that can be pledged as collateral to secure loans (Liberti & Mian, 2010). This makes it more possible for SMEs to ultimately access bank credit at more affordable rates, including long-term credit.

In underdeveloped financial markets that characterize many emerging markets, fixed (tangible) assets and political connections often serve as collateral for banks, but working capital does not (Porta & Lopez-de-silanes, 1999; Shleifer and Vishny, 1997). Therefore, firms in these markets that have limited tangible assets and are working capital-intensive, as is typically the case with small-scale firms, rely more on trade credit (Fabbri & Menichini, 2016) rather than bank credit, although strong creditor protection decreases the use of trade credit because of enhanced confidence of creditors in their capacity to repossess and liquidate pledged assets (Fabbri, Maria, & Menichini, 2010). A strong collateral law framework is particularly important in helping banks overcome concerns about borrower opaqueness and is even more important than bankruptcy law in many markets (Haselmann, Pistor, & Vig, 2010). This combination of

observations broadly supports the position that a well-developed legal and institutional framework that underpins financial market development will positively correlate with access to bank credit. Other research shows that this extends to bank lending to households for mortgage loans as well (De Haas, Ferreira, & Taci, 2010), suggesting that (a) the legal framework is indispensable for broad-based long-term lending, and (b) when the legal framework is sound, banks will provide secured lending to entities irrespective of their size. This latter point is important, as households are smaller entities than small-scale firms.

From the perspective of the creditor (lender), collateral in markets where the legal and institutional framework is more advanced (including in some emerging markets) has the benefit of positioning the lender as a more senior claimant during the liquidation and settlement of liabilities of insolvent debtors (Cerqueiro, Ongena, & Roszbach, 2016). Thus, concretely for bank lenders (and other creditors), collateral serves as a contractual device to help protect against losses. This makes the legal framework for debt resolution and capacity to enforce repossession and resale clauses an indispensable part of the framework.

Another consideration for creditors is the valuation of moveable and immoveable properties, which are obviously affected by legal framework issues (Torre et al., 2010). This is of particular relevance to SMEs as collateral valuation is one of the four differing techniques typically used to assess creditworthiness, along with (a) financial statement analysis, (b) credit scoring and (c) soft information associated with relationship lending (Moro & Fink, 2013). On this note, presenting credible financial accounting information is also important for SMEs to gain the lender's confidence in the borrower (Chen et al., 2013).

The degree of liquidity associated with collateralized assets is also a factor. On the one hand, logic suggests that the greater the liquidity, the greater the attractiveness of the asset as it should be easier to sell to offset losses from a loan in default. However, this conflicts with the position above regarding weaknesses in moveable property frameworks. As for highly liquid assets (e.g., securities, cash-equivalents), valuations may also be affected by degrees of liquidity in the marketplace.²⁶ Capital markets with low levels of liquidity typically lead to lower values for liquid assets, in some cases rendering them *de facto* illiquid. Moreover, land, commercial buildings and other structures may have higher values because of location or for other reasons, despite being "illiquid". Therefore, there are complexities associated with collateral properties, valuations and perceived degrees of liquidity that ultimately reflect differing assets and loans/investments with differing risk profiles and *ex-post* results in relation to default (Berger et al., 2016).

As noted in the Credit Decision Making section, an underdeveloped financial system drives up general costs in the business environment, making credit costlier and/or scarcer for SMEs (Beck, Lin, & Ma, 2014). Collateral and the legal framework impact creditor rights, such as the hierarchy of claimants in a default scenario, but collateral does not prevent losses for lenders. Rather, it serves to reduce *ex-post* LGD when losses occur (Berger et al., 2016; Norden & van Kampen, 2013), as collateral is typically a feature in both performing and non-performing loans. Therefore, all of these broader considerations affect credit access and rates as well as the valuation of collateralized assets (Cerqueiro et al., 2016).

More broadly, weak legal and institutional environments typically translate into higher incidence of or demands for collateral by lenders as a condition for offering loans, and shorter terms on loan exposures

when loans are made (Brown, Ongena, & Yeşin, 2011), which translate into a higher cost per dollar for emerging market borrowings than in higher income markets. Collateral, property registration (and rights), and secured transactions are also related to other legal and institutional components that are covered elsewhere in the thesis, namely creditor rights, contract enforcement, and insolvency resolution and bankruptcy. This results in the following hypothesis:

H5: If firms operate in markets with stronger property registration systems for immovable and moveable assets, then they will have higher levels of credit access. This extends to long-term credit patterns and is evident in all markets (high-income and emerging) and sectors.

D. Loan Covenants and Monitoring of Credit Quality

1. Financial Covenants

The discussion of loan covenants and agreements is closely linked to the *ex-post* monitoring efforts of creditors to ensure their loan portfolios are performing according to loan contract terms. According to one source, the use of financial covenants in the US market significantly declined in the period leading up to the financial crisis of 2008, and then resumed with considerable intensity in the aftermath (Murfin, 2012). Therefore, the use of loan covenants in structuring loan contracts and serving as a control tool for lenders is important for asset quality and capital management purposes of the banks, with considerable impact on borrower terms when SMEs and others access bank credit.

Many studies on loan covenants and corresponding agreements with borrowers focus on agency conflicts between borrowers and lenders in the bond markets and how price signals relate to information flows reflective of underlying credit quality (Beyhaghi, Panyagometh, Gottesman, & Roberts, 2017). For more standard credit from banks to borrowers, financial performance indicators represent core elements of borrower reporting, yet in some cases little has been documented on the non-price terms of loan contracts and how they are structured to convey needed information (Prilmeier, 2017b). This is surprising given their importance, as indicated by the incidence of covenant renegotiation that is actively managed by lenders to assert creditor control rights (Denis & Wang, 2014b).

Several studies have referenced the importance of covenants, although they are sometimes simply dummy variables in these studies (Godlewski & Weill, 2011; Hainz, Weill, & Godlewski, 2013) or represented by the number of general and financial covenants (Lin, Tsai, Hasan, & Tuan, 2018) without being specifically addressed. This is partly explained by (a) the multitude of covenants that exist (Freudenberg, Imbierowicz, Saunders, & Steffen, 2017), (b) differing definitions of covenants and how these are reported, and (c) because covenants are negotiated by lenders and borrowers to convey information specific to the transaction that varies from one borrower to the next (Demiroglu & James, 2010).

Prilmeier (2017) has noted frequencies of financial and nonfinancial covenant types that apply to large, publicly-listed US borrowers from 1995-2008, showing the most common financial covenants are (a) DEBT/EBITDA (57%), (b) Interest coverage (41%), and (c) Fixed charge covenant (40%). Other covenants such as liquidity (13%) are used less. Leverage ratios of the sort described above in relation to asset substitution are less common at 29%. More broadly, loan agreements typically include several specific

covenants along with more sweeping covenants that restrict dividend payments (78%) and asset sales (35%).

In a separate study, Demiroglu (2010) notes that the average loan includes three financial covenants, of which DEBT/EBITDA is the most commonly used (55%). Additional studies include DEBT/EBITDA (Beyhaghi et al., 2017; Denis & Wang, 2014b; Devos et al., 2012) and Interest Coverage (Cenni et al., 2015; Denis & Wang, 2014b; Devos et al., 2012; Kim & Sohn, 2017) as financial covenants. Loan contracts in a US-based sample have three general covenants (maximum of nine) and just one financial covenant (maximum of four) for borrowers (Lin et al., 2018). Other research has indicated more than 80 covenant types are available from existing data sources (Freudenberg et al., 2017), many of which are included in Annex 1.

SMEs seeking to access external finance need to demonstrate adherence to Basel framework principles governing bank capital and liquidity management that do not jeopardize the position of creditors or investors, or at least do not induce losses that exceed their Expected Loss estimates (Norden & van Kampen, 2013). Therefore, aligning borrower needs and management of loan performance information with creditor screening and monitoring requirements is considered an important factor for SMEs to be able to access credit in the first place. Such alignment is important not only for financial management purposes of the lenders, but also to help reduce bank operating costs associated with monitoring which are disproportionately high when the portfolio is largely composed of small business loans (Sampagnaro, Meles, & Verdoliva, 2015).

When SMEs succeed in accessing external finance, loan covenants typically set ratios that serve as *de facto* targets for leverage (e.g., debt-to-equity/assets, total liabilities-to-equity/assets) (Calabrese & Zenga, 2010; Prilmeier, 2017b), not altogether dissimilar to trade-off theory leverage targets. However, as large-scale firms more typically have the financial and operational resources to calibrate their capital structures (Graham & Harvey, 1999), lenders are more likely to be comfortable lending to such firms due to their capacity to adjust capital structure to comply with loan covenants. By extension, unlevered firms tend to be comparatively smaller (Devos et al., 2012), as noted in the “low leverage puzzle” literature.

However, not all banks or financial intermediaries (e.g., credit unions) are exclusively focused on large-scale firms. In some cases, they are “relationship-oriented” and focused on smaller firms (Berger et al., 2015; Bouslama, 2014; Ferri, Kalmi, & Kerola, 2014; Gropp & Guettler, 2018; Moro & Fink, 2013). Some have gone as far as to suggest that such lending can be more profitable for lenders by helping them achieve higher returns on assets (ROA) (Bouslama, 2014), as is the case with “shadow” banks (Billett et al., 2016b). Those firms that attract external financing (debt and/or equity) are, therefore, able to manage pecking order issues and adjust their capital structures based on anticipated business needs or preferences. This results in the following hypothesis:

H6: If firm size is positively correlated with favorable financial covenant indicators used in loan agreements for borrower debt service (timely and full principal and interest payments), then larger firms will benefit from greater credit access than smaller firms. This applies to all markets (high-income and emerging), to listed and unlisted firms, and in all sectors.

2. *Legal and Institutional Framework for Loan Agreement Enforcement*

The legal and institutional framework is important as an indicator of financial system development, which influences credit allocation at all stages. An underdeveloped financial system drives up general costs in the business environment, making credit costlier and/or scarcer for SMEs (Beck et al., 2014). However, advanced legal frameworks differ in their incentive structures and degrees of protection of debtor assets of the borrower versus secured creditor rights versus unsecured creditor rights versus shareholder rights (Acharya, Amihud, et al., 2011b; Blazy, Chopard, & Nigam, 2013). Therefore, the legal and institutional framework is important not only in terms of the actual laws and efficiency of enforcement, but also how the incentives are structured in relation to outcomes. The stronger the incentives for lenders to recover loan principal and to ensure interest payments are kept current by borrowers, the more likely it will be that bankers will extend loans and take risk, resulting in more loan approvals that result in greater access to finance for a larger number of borrowers (Houston et al., 2010).

Firm-level governance is also a critical factor, with a close relationship between strong legal institutions and strong firm-level governance resulting in banks charging less for loans, extending credit in larger amounts for longer periods, and imposing fewer restrictive covenants in loan agreements (Ge, Kim, & Song, 2012). This is important in relation to the downside risk of earnings management, as research suggests (a) the incidence of earnings management is high²⁷ (Dichev, Graham, Harvey, & Rajgopal, 2016; Firth, Rui, & Wu, 2011), (b) banks are not always effective at curbing management manipulation of financial accounting data linked to covenants (Jha, Shankar, & Prakash, 2015), and (c) the increased use of special purpose entities may compound *ex-post* monitoring weaknesses due to risks of information asymmetries that are not entirely offset by higher loan rates and collateral requirements and more restrictive covenants (Kim, Song, & Wang, 2017). Therefore, as banks cannot police the internal operations of the firms to which they lend on a daily basis once a loan is disbursed, borrowers' capacity to self-govern (Acharya et al., 2011) is important on an *ex-ante* basis to reduce agency risk and to provide creditors with confidence in the borrowers to which they lend so that *ex-post* tightening can be minimized. Firms with weak governance quality will face significantly higher loan spreads, higher fees, shorter loan maturities, smaller loan sizes, greater collateral requirements, and stricter covenants due to the private benefits of control (Lin et al., 2018), consistent with agency theory (Jensen & Meckling, 1976).

In some cases, bank lenders face frictions with non-bank creditors or with shareholders, and not just borrowers themselves. In the case of non-bank creditors, syndicated loans that traditionally were provided by bank lenders are now provided by a mix of bank and non-bank lenders, each with differing risk appetites. This has resulted in frictions within these pools of capital providers in relation to loan contracts, the specific financial covenants included (if any), and whether more conventional and regulated lenders like banks are unduly exposed to credit risk in their portfolios as a result of the joint financing provided with non-bank entities (Billett, Elkamhi, Popov, & Pungaliya, 2016a). When the financing involves syndications, the lead bank is responsible for ensuring *ex-ante* screening has captured borrower and project risk profiles so that the lenders will not experience unexpected losses. This then translates into reputation considerations not just for the lead lender but for the other syndicated lenders having input into the covenants included in the loan agreement to protect against financial losses and reputation risk.

Frictions can also exist for bank lenders in relation to shareholders and whether the bankruptcy code is comparatively favorable to debtholders or shareholders. Earlier sections of the thesis have noted the importance of creditor rights and collateral and how a strong legal and institutional framework included protection of minority shareholder rights. It is also important to note that the comparative favorability of creditor rights in relation to shareholders is of critical importance in the *ex-post* phase of credit allocation. Creditors and shareholders are rival claimants in a bankruptcy or liquidation scenario. Therefore, testing of legal and institutional variables also includes the strength of both creditor rights via contract enforcement scores and shareholder rights via insolvency framework scores. As each financial system has differing degrees of “friendliness” to debt-holders (creditors) versus equity-holders (shareholders), incentives in the legal and institutional framework will influence *ex-ante* credit decision making. Capital structure choice for firms is partly driven by the bankruptcy code under which the firm operates (Acharya, Sundaram, & John, 2011; Öztekin, 2015), with the end liquidation value of the firm being a key determinant in the amount of credit made available (supply side) and utilized (demand side). Therefore, both components are important, while also containing frictions between them.

Asset substitution risk and borrower moral hazard have long been identified as potential risk issues for creditors (Bharath, Dahiya, Saunders, & Srinivasan, 2011; Jensen & Meckling, 1976). Asset substitution risk arises when a company exchanges its low-risk assets for high-risk investments, effectively transferring value from a firm's bondholders to its shareholders, while borrower moral hazard results from informational frictions due to borrower incentives to divert cash flows for private gain or excessive risk taking. Creditors thereby impose loan covenants to protect their interests by reducing the presumed penchant of managers to rebalance assets based on debt-equity or other financial covenant targets (Demiroglu & James, 2010). However, not all research supports this point of view. Rather than entrenched managers seeking to avoid the disciplinary effects of monitoring resulting from debt (loan contracts), other research supports the notion that comparatively small and young firms are credit-constrained, and that they face stricter earnings-based covenants than other firms (Devos et al., 2012). Yet other research rejects both streams above and claims that the strictness of covenants is directly related to prior violations, resulting in more costly credit for the borrower and tighter covenants (Freudenberg et al., 2017). Therefore, rather than agency issues or specific firm characteristics of credit-constrained firms, this research argues that covenant violations and borrower characteristics at the origination of the new loan explain the relative cost of credit and strictness of associated covenants. Particularly after the financial crisis of 2008, banks now react to payment defaults by tightening financial covenants across all exposures in their portfolios, adding considerable costs to borrowers as a result of loan contract and covenant tightening (Murfin, 2012). When lenders experience payment defaults, they write tighter contracts for all subsequent borrowers across industries and geographic markets to shore up capital and reputation in the market. Therefore, payment defaults, particularly on recently originated loans, serve as an indication of inadequate *ex-ante* screening that is remedied by stricter *ex-post* monitoring that imposes costs on borrowers that are equivalent to a two-notch downgrade in borrower bond ratings. A fourth stream accepts all of these observations and attributes the strength of legal institutions and internal firm governance as a major factor in bank loan contracting, including financial and other covenants (Ge et al., 2012).

There is abundant research that claims the opaqueness of SME information often deters lenders and investors from providing financing to SMEs unless they can effectively screen for these risks to mitigate adverse selection (Berger & Black, 2011; Yunhao Chen, Jiang, & Lee, 2015b; Godlewski & Weill, 2011), which is now made more possible with the advent of well-developed credit information bureaus (Doblas-Madrid & Minetti, 2013), or drives up costs of loans due to opacity when loans are actually made (Jha et al., 2015). Justified or not, loan covenants mitigate the risk of asset substitution risk and potential for moral hazard. Therefore, *ex-post* covenants and the legal framework to enforce contracts play a key role in *ex-ante* decision making as well as *ex-post* management and monitoring of credit quality, even if there is evidence to suggest that many creditworthy firms are credit-constrained.

Collateral and the legal framework impact on creditor rights (a) influence the role and specificity of loan covenants that govern loan exposures, (b) affect the terms of interest service and principal repayment that are set by the lender, and (c) broadly provide a tool for *ex-post* monitoring of loan credit once the loan is originated and disbursed. Longstanding banking relationships with effective transmission of soft information also help to shape information flows to induce lender confidence in the borrower (Yehning Chen et al., 2013), resulting in lower collateral requirements, larger loans and better terms (Bharath et al., 2011). Loan covenants also ease over time with performance, but harden considerably if there are violations (Prilmeier, 2017b).

When there are violations, creditors need to determine a course of action to remedy the loss. This includes loan restructuring (e.g., rescheduling) or liquidation, with the costs associated with the respective processes impacting the creditor's course of action. This raises issues of the legal and institutional environment for contract enforcement and bankruptcy/insolvency frameworks and how this affects general levels of credit access. The assumption here is that, consistent with H2 (and H5 when transactions are secured), the stronger the general legal and institutional framework for creditors, the more comfortable creditors are in taking risk, thereby influencing *ex-ante* decision making. However, determining whether these patterns support firm size bias in credit allocation is more problematic. For instance, a strong environment may lead to higher credit access in general (including for SMEs) as a share of GDP, while still reflecting positive correlation between firm size and credit access as shown in firm size shares of net domestic credit. This would translate into the legal and institutional framework assessment playing a key role in *ex-ante* decision making, and only indirectly in relation to *ex-post* monitoring.

A more plausible consideration is that the firm size bias manifests itself in tougher financial covenants for smaller firms than for larger firms as a condition for accessing credit in the first place because of the *ex-ante* and collateral factors favoring larger firms. In other words, because larger firms have more cash flow and assets to pledge, they enjoy higher loan principal and lower interest coverage covenants than do smaller firms. However, this may also be offset by the superior negotiating power larger firms have when confronted by creditors seeking to remedy problems exposures. This results in the following hypothesis:

H7: If firms operate in markets with better contract enforcement and insolvency resolution, they will have higher levels of credit access than firms operating in markets with less effective contract enforcement and insolvency resolution. This applies in all markets (high-income and emerging), to listed and unlisted firms, and in all sectors.

E. Relevance of Literature Review to Variable Selection

1. Credit Decision Making

The selection of credit decision making independent variables is influenced by four key factors: (a) data limitations (described above), (b) complementarity with additional explanatory variables used in the collateral and secured transactions section, (c) fit with the credit monitoring variables that relate to loan agreements and covenants used to monitor borrower performance and loan quality, and (d) ease of use to avoid excess complexity in assessing relationships of explanatory variables with access to credit (as the dependent variable).

For financial indicators, the starting point has been to create an inventory of indicators from the Literature Review that apply to credit decision making, the role of pledged assets as collateral, and lender monitoring once loans are made. The next step in determining variables was to select those that apply to each area of focus without inviting issues of collinearity. For credit decision making, the process focused on a small number of indicators that are relevant to creditors on an unsecured basis. (The section on collateral addresses tangibility and secured transactions.) Therefore, (a) EBIT/ASSETS (Almamy, Aston, & Ngwa, 2016; Aslan, 2016b; Ben-Nasr, 2016; Caneghem & Campenhout, 2012; Cenni et al., 2015; Coricelli et al., 2012; Dasilas & Papasyriopoulos, 2015; Daskalakis et al., 2017, 2014; Filipe et al., 2016; Ramalho & da Silva, 2009; Traczynski, 2017) is used as a proxy for operating profitability and earnings efficiency, while (b) Financial Slack is Net Working Capital (Bee & Abdollahi, 2013; Cenni et al., 2015; Chen, 2016) and is used as a measure of liquidity that also reflects earnings retained by firms. Both EBIT and Financial Slack are presented as a share of total assets for comparative purposes.

For institutional indicators relevant to credit decision making, two summary scores from the World Bank's *Doing Business Indicators* (2019) report are used: (a) data on the Depth of Credit Information Index (in Getting Credit), which accounts for credit information, and (b) Protecting Minority Investors, to account for disclosure that can impact *ex-ante* credit decision making and to also account for the equity side of capital structure issues as they apply to SME access to finance (Lucey & Zhang, 2011). Institutional framework indicators are further supplemented by (c) Regulatory Quality scores in the World Bank *Governance and Regulatory Effectiveness Index* (results through 2018) to capture financial sector development and to serve as a proxy for the business environment. The approach and mix of institutional and financial variables is influenced by several studies that have reviewed capital structure and financing in emerging markets (Belkhir et al., 2016a; Ben-Nasr, 2016; Favara et al., 2017; Gao & Zhu, 2015; González, 2013b; Houston et al., 2012; Öztekin, 2015).

In all three cases, the most recent scores are utilized. Following other studies (Calomiris, Larrain, Liberti, & Sturgess, 2017b; Öztekin, 2015), countries are grouped into “strong” and “weak”, with the former representing markets above the median and the latter representing markets at or below the median. (This methodology allows for use of institutional proxies in all three areas of focus addressing credit decision making, pledged assets as collateral, and credit monitoring considerations.)

2. Collateral and Secured Transactions

The selection of collateral variables is influenced by three key factors: (a) data limitations (described above), (b) complementarity with additional explanatory variables used for credit decision making, and

(c) ease of use to avoid excess complexity in assessing relationships of explanatory variables with access to credit (as the dependent variable).

For financial indicators, tangibility features in many of the studies with multiple configurations that include (a) Gross PPE/Total Assets (Cook, Fu, & Tang, 2016), (b) Net PPE/Total Assets (Belkhir et al., 2016a), (c) (Fixed + Depreciable Assets)/Total Assets (Cole, 2013), (d) Fixed Assets/Total Assets (Dasilas & Papasyriopoulos, 2015), (e) Net Fixed Assets/Total Assets (Gao & Zhu, 2015; Lucey & Zhang, 2011), (f) (Net Fixed Assets + Inventories)/Total Assets (Caneghem & Campenhout, 2012), (g) Tangible Fixed Assets/Total Assets (Guida & Sabato, 2017a), and (h) (Tangible Fixed Assets + Inventories)/Total Assets (Calomiris et al., 2017b; Dewaelheyns & Hulle, 2010; Ramalho & da Silva, 2009). While these are all quite similar in the treatment of PPE, there are differences in specifications regarding inventories that influence specifications for moveable assets. Therefore, the approach taken was to adapt the available data to fit the research objective and support inferences about the potential use of tangible fixed assets as collateral for secured transactions, and to be able to do so on a more granular level differentiating immoveable assets from moveable assets. This resulted in the use of net PPE broken out by immoveable and moveable assets as described above. Therefore, net Tangible Fixed Assets equals net PPE which equals net Immoveable Assets (net property and plant) plus net Moveable Assets (net machinery and equipment).

This approach has an additional benefit of complementing the definition of Financial Slack (Net Working Capital/Assets), used as an independent variable in the *ex-ante* section. Including inventories in the definition of moveable assets would lead to double-counting and collinearity. Therefore, the narrower definition as applied above is cleaner. A third benefit is that the approach allows for closer alignment with term credit patterns on the assumption that there is matching of PPE with long-term credit (while inventories are typically used to secure short-term working capital lines of credit) (Norden & van Kampen, 2013).

For institutional indicators, summary scores from the World Bank's *Doing Business Indicators* (2019) report were used for Registering Property to apply to immoveable assets, and the Legal Rights Index (of Getting Credit) to apply to the moveable assets. For the former, the score is calculated on a 12-point scale as reported by the World Bank. Therefore, a score of "8" would equal 67%. For the latter, the score is calculated on an 8-point scale as reported by the World Bank and follows the same logic as described above (e.g., "6" on a scale of "8" = 75%).

Following other studies (Calomiris et al., 2017b; Öztekin, 2015), countries are grouped into "strong" and "weak", with the former representing markets above the median and the latter representing markets at or below the median for each of the two indicators. The discussion then highlights the degree of consistency or variation there is in the institutional framework and then how these correlate (positively or negatively) with credit access patterns.

3. Credit Monitoring

The selection of credit monitoring variables is influenced by four key factors: (a) complementarity with additional explanatory variables used in the credit decision making and collateral and secured transactions variables, (b) fit of the variables as they relate to loan agreements and covenants used to monitor borrower performance and loan quality, (c) avoidance of independent variables that would closely

correspond to dependent variables, and (d) ease of use to avoid excess complexity in assessing relationships of explanatory variables with access to credit (as the dependent variable).

For financial indicators, loan agreements typically involve maximum leverage ratios (e.g., Total Liabilities to Net Worth or Equity, Total Debt to Equity). However, including such a ratio as an independent variable when the dependent variable accounts for most of the numerator would invite issues of collinearity. Likewise, including a liquidity covenant would overlap with the Net Working Capital figure used in the credit decision making indicators selected.²⁸

Instead, the credit monitoring process focused on ratios that are among the most important and frequently used covenants in loan agreements that also represent flow measures, rather than focusing strictly on balance sheet or capital structure values (Beyhaghi et al., 2017; Denis & Wang, 2014a; Devos et al., 2012; Prilmeier, 2017a). Therefore, (a) DEBT/EBITDA is used as a proxy for the capacity of a borrower to repay loan principal from operating cash flow based on EBITDA, while (b) Interest Coverage (Cenni et al., 2015; Devos et al., 2012; Prilmeier, 2017a), or Operating Profits divided by Interest Paid, is used to represent a borrower's capacity to meet interest expense requirements according to contract terms. Both financial indicators are presented on a percentage basis.

The selection of two financial covenants is consistent with two other studies that focused on the information content of bank loan contracts and covenants (Demiroglu & James, 2010; Denis & Wang, 2014a). In both studies, a maximum DEBT/EBITDA ratio was also used. The former also used a minimum Current Ratio covenant to test for liquidity. This ratio serves the purpose of testing for a firm's ability to cover interest expense in a similar way that the Interest Coverage ratio is used in the thesis. The second study used a sweeping covenant limiting capital expenditures, which would help to protect against the risk of wasteful cash outflows that could potentially jeopardize cash on hand for both interest and principal payments. Therefore, while both are slightly different from the two financial covenant variables used in this thesis, all three approaches attest to the challenges in testing a large number of covenants.

For legal and institutional indicators, two summary scores from the World Bank's *Doing Business Indicators* (2019) report were used: (a) data on Enforcing Contracts are used to reflect how the legal and institutional framework affects loan agreements and covenants as measured by time, cost and quality of judicial processes, and (b) data on Resolving Insolvency serves as an indicator of the relative effectiveness of processes related to bankruptcy, insolvency and dispute resolution measured by time, cost and recovery rates.

Following other studies (Calomiris et al., 2017b; Öztekin, 2015), countries are grouped into "strong" and "weak", with the former representing markets above the median and the latter representing markets at or below the median.

III. Methodology and Data

A. Original Research Plans

The original research plan was based on a two-stage model based on Daskalakis et al (2014) in which a sample of Greek SMEs (defined differently from this research) were separated into three sub-samples, and then tested to determine whether the magnitude of the coefficients of the regressors was different among groups. Differences would then signify the relative contribution of each variable, which would then identify differences in the financing behavior among the three groups (Daskalakis et al., 2014).

The first stage analyzed how the main factors of capital structure determination (profitability, asset structure, size, growth) affected capital structure for each group. This was to identify differences regarding the direction of the relationship between the debt ratio and the regressors for each group. The authors used a balanced panel model containing large numbers of cross-sectional units and a short number of time periods (four years). The hypothesis tested independently for each sub-sample was that the capital structure of the firm expressed by the ratio of total liabilities to total assets depended on its asset structure, size, profitability and growth rate:

$$DR_{i,t} = \beta_0 + \beta_1 AS_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 PROFIT_{i,t} + \beta_4 GROWTH_{i,t} + e_{i,t}$$

where $DR_{i,t}$ is the debt ratio of firm i at time t ; $AS_{i,t}$ the asset structure of firm i at time t ; $SIZE_{i,t}$ the size of firm i at time t ; $PROFIT_{i,t}$ the profitability of firm i at time t ; $GROWTH_{i,t}$ the percentage change in earnings of the firm i between time t and $t-1$; and $e_{i,t}$ the error term.

The second stage involved an F -test by pooling the data for all three sub-groups together to estimate a panel model which restricted coefficients of capital structure determinants to be the same for all firms. This was to test whether the magnitude of the regression coefficients from the first stage was different among groups, and to identify differences in the relative contribution of each variable. The F -statistic then attached the information obtained from the (unrestricted) individual sub-sample models. The F -statistic for this test was given by:

$$F = \frac{(RSS_{SMEs} - RSS_{Micro} - RSS_{Small} - RSS_{Medium})/2k}{(RSS_{Micro} + RSS_{Small} + RSS_{Medium})/(n - 3k)}$$

where RSS_{SMEs} is the residual sum of squares for the restricted model of all SMEs; RSS_{Micro} the residual sum of squares for the model containing only micro firms; RSS_{Small} the residual sum of squares for the model containing only small firms; RSS_{Medium} the residual sum of squares for the model containing only medium firms; n number of observations; and k number of variables.

This approach was adapted to the existing structure of the research by not using micro firms, but including large-scale firms. The first version of the research sought to replicate the above approach, but with a dependent variable definition that was more focused on bank debt (and corporate bonds for larger companies) as a share of assets than total liabilities to assets, and different dummy variables that would provide a slightly different narrative in terms of the differences regarding the direction of the relationship between the dependent variable (debt ratio) and the independent variables or regressors for each group (small, medium and large). The independent variables for the main test were returns, margins,

creditworthiness and solvency. This was different from Daskalakis et al (2014), but related to their main factors of profitability, asset structure, size and growth. The contribution of the original research was intended to be able to differentiate firm-level financial performance and efficiency measures in the form of margins and creditworthiness. Returns were thought to correspond well to profitability, and solvency was thought to correspond well to asset structure. Size was considered to be captured in the structure of the segmentation in revenue quantiles. Therefore, only growth was missing from the formula. Moreover, robustness tests included variables that matched up well with the main regressors to validate or test results. The original research equation was expressed as:

$$DR_{i,t} = \beta_0 + \beta_1 RETURN_{i,t} + \beta_2 MARGIN_{i,t} + \beta_3 CREDITWORTHINESS_{i,t} + \beta_4 SOLVENCY_{i,t} + e_{i,t}$$

where $DR_{i,t}$ was the debt ratio of firm i at time t ; $RETURN_{i,t}$ was return on (average) assets in the main test of firm i at time t ; $MARGIN_{i,t}$ was the net margin of firm i at time t ; $CREDITWORTHINESS_{i,t}$ was the operating cash flow (or EBITDA) of firm i at time t ; $SOLVENCY_{i,t}$ was the share of shareholder equity to assets of firm i at time t ; and $e_{i,t}$ was the error term.

The results for this initial testing did not generate the kinds of results needed to pursue the research objectives. This was mainly because the variables themselves had considerable overlap in some cases, resulting in problems of collinearity and multicollinearity. Above all, net margins represented the numerator of both RETURN and MARGIN, and also served as a major portion of CREDITWORTHINESS. Robustness tests with different variables but the same general structure likewise suffered from the same weaknesses, particularly RETURN (return on average equity) and MARGIN (EBITDA margin).

This resulted in a shift in the research to identify variables that could potentially meet the research objectives without the issues of collinearity and multicollinearity that emerged in the first version, while also accounting for other institutional variables that could help compensate for a more streamlined set of econometric specifications intended to avoid collinearity and multicollinearity problems. Therefore, in addition to identifying new independent variables, the structure of the research and equations was disaggregated into three segments. The first was to identify variables that would help explain the willingness of lenders to provide credit irrespective of whether it was on a secured basis. The second was to identify variables that would help explain whether collateral pledges had an effect on the willingness of lenders to provide credit. The third was to identify variables that would help explain credit performance metrics lenders would use to enforce loan contracts.

The rationale behind this segmented approach was that a streamlined approach to financial indicators alone would limit explanatory power, and that institutional variables would themselves enhance the description while also posing low risk of collinearity and multicollinearity. This would result in a structured description and profile of credit access by firm size that would allow the research to test the main hypotheses focused on the positive correlation of firm size to credit access. However, testing under this segmented approach resulted in unsatisfactory results. Therefore, a more consolidated approach that integrated all independent variables and dummy variables by category of interest was followed to satisfactorily test for firm size effects in credit access (and allocation), as described in the rest of Section 3 below.

B. General Methodology—Partitioning, Use of Dummy Variables and Testing

To carry out hypothesis testing, the thesis adapts a dummy variable technique (Karafiath, 1988) that is suitable for the data collected to integrate into the linear regression analyses by category of interest. This methodology relies on a partitioning technique that allows for binary segmentation of data processing of independent variables in relation to dependent variables. This applies to legal and institutional variables and category dummy variables. Financial independent variables have financial values, typically in the form of ratios, but are then partitioned by firm size. Therefore, all independent variables and categories of interest are partitioned.

Specific to the research, the hypotheses seek to test for access to credit based on firm size, segmented into three groups by annual revenue size. This results in a matrix for the dependent variable, $DEBT_{i,x}$ which is defined as bank debt (and corporate bonds for those firms able to issue securities), and is composed of bank lines of credit ($LOC_{i,x}$), current maturities of long-term debt ($CMLTD_{i,x}$) and long-term debt ($LTD_{i,x}$). The research is focused on the total $DEBT_{i,x}$ figures for the general profile of access to credit, and then $CMLTD_{i,x} + LTD_{i,x}$, for the degree of access SMEs have to long-term financing to make investments in fixed assets and other long-term requirements to scale up operations.

Broad measures of access are reflected in dollar terms, which are presented in univariate data as well as some of the ANOVA testing. Firm-specific measures are more typically reflected in shares of assets, with dependent variables ultimately presented in most statistical testing as shares of assets as well. The research assumes that $LOC_{i,x}$ is mainly related to working capital and trade finance that is not the specific focus of this thesis. However, $LOC_{i,x}$ is captured in the total $DEBT_{i,x}$ figures. The matrix may be partitioned as follows:

FIRM SIZE		>\$50 MM	\$10-\$50 MM	\$2-\$10 MM
X =	>\$50 MM = Large	1	0	0
	\$10-\$50 MM = Medium	0	1	0
	\$2-\$10 MM = Small	0	0	1

where each firm size segment is a dummy in which the dummy variable is equal to one on relevant observations and is equal to zero elsewhere. Each of the variables in the equation is broken out accordingly, as they are with $DEBT_{i,x}$ and $LTD_{i,x}$.

Five of the six financial independent variables related to earnings, working capital, tangible fixed assets and debt coverage are presented in the form of ratios that are calculated from the original financial accounting data. The interest coverage variable is presented as a ratio in its original form, but has been validated through calculations. In each case, these variables are partitioned using the dummy variable technique to include/exclude (similar to “Yes”/“No”) based on a binary system, with the include/exclude determined by specified revenue quantile and category of interest.

For all seven of the legal and variables, the dummy variable process is binary based on a simplified and uniform system by which “1” is above the median and “0” is at or below the median. Median scores for

all legal and institutional variables are determined on a global scale based on data for all countries included in the Level 1 sample for which data are available. The relevant scores are then integrated into the equations as they apply based on the specifications of the test. Table 4 below presents the scores and determination of medians for each of the legal and institutional variables.

Table 4: Legal and Institutional Variable Scores for Determination of Medians

This table presents median scores for all seven legal and institutional variables identified in econometric specifications. (All independent variables are described in Table 5.) Panel (1) applies to the three legal and institutional variables considered most relevant to credit decision making. Panel (2) applies to the two legal and institutional variables considered most relevant to pledged assets as collateral and secured transactions. Panel (3) applies to the two legal and institutional variables considered most relevant for credit performance monitoring. Column (1) specifies the country. Column (2) specifies the region. Columns (1) and (2) apply to all three panels. Column (3) specifies the median score for CREDINFO. Column (4) specifies the median score for MINSH. Column (5) specifies the median score for REGEFF. Column (6) specifies the median score for PROPERTY. Column (7) specifies the median score for LRINDEX. Column (8) specifies the median score for CONTRENF. Column (9) specifies the median score for INSOLV.

(1) Country	(2) Region	Panel 1: Credit Decision Making			Panel 2: Collateral		Panel 3: Credit Monitoring	
		(3) CREDINFO	(4) MINSH	(5) REGEFF	(6) PROPERTY	(7) LRINDEX	(8) CONTRENF	(9) INSOLV
Afghanistan	SOUTHASIA	0.000	0.717	-1.133	0.275	0.833	0.318	0.518
Albania	EMEUROPE	0.750	0.717	0.282	0.621	0.667	0.564	0.674
Algeria	AFRICA	0.000	0.350	-1.264	0.443	0.167	0.548	0.492
Angola	AFRICA	0.000	0.550	-1.000	0.432	0.083	0.263	0.000
Antigua	CARIBBEAN	0.000	0.517	0.412	0.566	0.417	0.681	0.354
Argentina	LATAMERICA	1.000	0.617	-0.243	0.567	0.250	0.557	0.412
Armenia	EMEUROPE	1.000	0.633	0.269	0.870	0.500	0.706	0.440
Australia	HIASIPAC	0.875	0.600	1.929	0.741	0.917	0.790	0.789
Austria	HIEUROPE	0.875	0.683	1.545	0.800	0.333	0.755	0.775
Azerbaijan	EMEUROPE	1.000	0.817	-0.381	0.846	0.667	0.675	0.638
Bahamas	CARIBBEAN	0.000	0.433	0.151	0.433	0.500	0.591	0.534
Bahrain	MIDDLEEAST	1.000	0.667	0.446	0.811	0.083	0.518	0.446
Bangladesh	SOUTHASIA	0.000	0.550	-0.826	0.289	0.417	0.222	0.282
Barbados	CARIBBEAN	0.000	0.350	0.540	0.543	0.500	0.380	0.698
Belarus	EMEUROPE	0.875	0.633	-0.660	0.922	0.333	0.694	0.526
Belgium	HIEUROPE	0.625	0.617	1.234	0.514	0.667	0.643	0.839
Belize	LATAMERICA	0.000	0.433	-0.659	0.524	0.333	0.501	0.459
Benin	AFRICA	0.000	0.400	-0.339	0.542	0.500	0.373	0.407
Bhutan	SOUTHASIA	0.875	0.467	-0.335	0.730	0.333	0.700	0.000
Bolivia	LATAMERICA	0.875	0.400	-0.895	0.499	0.000	0.547	0.423
Bosnia- Herz.	EMEUROPE	0.750	0.583	-0.206	0.620	0.583	0.597	0.678
Botswana	AFRICA	0.750	0.567	0.455	0.654	0.417	0.500	0.480
Brazil	LATAMERICA	1.000	0.650	-0.313	0.519	0.167	0.500	0.480
Brunei	EMASIPAC	1.000	0.650	0.685	0.515	1.000	0.610	0.551
Bulgaria	EMEUROPE	0.625	0.683	0.577	0.693	0.667	0.670	0.575
Burkina Faso	AFRICA	0.000	0.400	-0.386	0.505	0.500	0.411	0.409
Burundi	AFRICA	0.000	0.433	-0.983	0.626	0.167	0.430	0.306
Cambodia	EMASIPAC	0.750	0.500	-0.505	0.552	0.833	0.318	0.484
Cameroon	AFRICA	0.750	0.417	-0.799	0.379	0.500	0.399	0.366
Canada	NORAMERICA	1.000	0.783	1.665	0.793	0.750	0.571	0.815
Cape Verde	AFRICA	0.750	0.367	-0.241	0.667	0.083	0.667	0.000
CAR	AFRICA	0.000	0.400	-1.367	0.419	0.500	0.314	0.281
Chad	AFRICA	0.000	0.383	-1.112	0.526	0.500	0.455	0.281
Chile	LATAMERICA	0.875	0.600	1.344	0.709	0.333	0.658	0.599
China	EMASIPAC	1.000	0.600	-0.135	0.808	0.333	0.790	0.558
Colombia	LATAMERICA	0.875	0.750	0.328	0.712	1.000	0.343	0.674
Comoros	AFRICA	0.250	0.400	-1.117	0.577	0.500	0.330	0.000
Congo	AFRICA	0.000	0.367	-1.474	0.471	0.500	0.333	0.000
Congo, DR	AFRICA	0.125	0.400	-1.362	0.379	0.500	0.440	0.378
Costa Rica	LAT AMERICA	0.875	0.483	0.479	0.744	0.833	0.533	0.345
Côte d'Ivoire	AFRICA	1.000	0.400	-0.191	0.580	0.500	0.557	0.480
Croatia	EMEUROPE	0.750	0.667	0.447	0.741	0.417	0.706	0.562
Cyprus	EMEUROPE	0.625	0.667	1.017	0.635	0.583	0.486	0.755
Czech Rep.	EMEUROPE	0.875	0.583	1.262	0.797	0.583	0.564	0.801
Denmark	HIEUROPE	0.750	0.667	1.677	0.899	0.667	0.739	0.851
Djibouti	AFRICA	0.000	0.817	-0.706	0.582	0.417	0.484	0.609
Dominica	CARIBBEAN	0.000	0.517	0.082	0.434	0.500	0.592	0.345
Dom. Rep.	LATAMERICA	1.000	0.567	-0.077	0.657	0.083	0.469	0.375
Ecuador	LATAMERICA	1.000	0.467	-0.890	0.658	0.083	0.594	0.254
Egypt	AFRICA	1.000	0.583	-0.867	0.550	0.417	0.428	0.423
El Salvador	LATAMERICA	0.875	0.383	-0.039	0.663	0.750	0.553	0.456
Equ. Guinea	AFRICA	0.250	0.400	-1.558	0.445	0.500	0.562	0.000
Eritrea	AFRICA	0.000	0.317	-2.231	0.353	0.000	0.559	0.000
Estonia	EMEUROPE	0.875	0.567	1.563	0.910	0.583	0.743	0.625

Eswatini	AFRICA	0.875	0.417	-0.604	0.587	0.333	0.367	0.387
Ethiopia	AFRICA	0.000	0.283	-0.974	0.513	0.250	0.628	0.305
Fiji	EMASIAPAC	0.000	0.517	-0.220	0.719	0.417	0.571	0.438
Finland	HIEUROPE	0.750	0.583	1.787	0.807	0.583	0.664	0.928
France	HIEUROPE	0.750	0.667	1.173	0.633	0.333	0.749	0.741
Gabon	AFRICA	0.250	0.383	-0.884	0.371	0.500	0.328	0.363
Gambia	AFRICA	0.000	0.367	-0.632	0.533	0.583	0.539	0.366
Georgia	EMEUROPE	1.000	0.817	1.123	0.929	0.750	0.769	0.560
Germany	HIEUROPE	1.000	0.583	1.749	0.657	0.500	0.704	0.901
Ghana	AFRICA	0.750	0.517	-0.080	0.555	0.500	0.540	0.249
Greece	HIEUROPE	0.875	0.633	0.295	0.476	0.250	0.502	0.554
Grenada	CARIBBEAN	0.000	0.433	-0.293	0.501	0.500	0.593	0.000
Guatemala	LATAMERICA	0.875	0.317	-0.196	0.649	0.750	0.346	0.276
Guinea	AFRICA	0.000	0.400	-0.778	0.519	0.500	0.539	0.391
Guinea-Biss.	AFRICA	0.000	0.417	-1.199	0.545	0.500	0.386	0.000
Guyana	LATAMERICA	1.000	0.517	-0.532	0.575	0.250	0.579	0.224
Haiti	CARIBBEAN	0.000	0.217	-1.224	0.323	0.167	0.525	0.000
Honduras	LATAMERICA	1.000	0.417	-0.469	0.634	0.750	0.455	0.321
Hong Kong	EMASIAPAC	0.875	0.783	2.206	0.736	0.667	0.691	0.657
Hungary	EMEUROPE	0.750	0.500	0.602	0.801	0.750	0.710	0.550
Iceland	HIEUROPE	0.875	0.700	1.418	0.866	0.417	0.691	0.819
India	SOUTHASIA	0.875	0.800	-0.184	0.436	0.750	0.412	0.408
Indonesia	EMASIAPAC	1.000	0.633	-0.071	0.617	0.500	0.472	0.679
Iran	MIDDLEEAST	1.000	0.333	-1.296	0.640	0.167	0.582	0.356
Iraq	MIDDLEEAST	0.000	0.467	-1.219	0.577	0.000	0.480	0.000
Ireland	HIEUROPE	0.875	0.750	1.595	0.696	0.583	0.560	0.791
Israel	MIDDLEEAST	0.875	0.733	1.247	0.642	0.500	0.579	0.727
Italy	HIEUROPE	0.875	0.583	0.671	0.817	0.167	0.548	0.773
Jamaica	CARIBBEAN	1.000	0.550	0.278	0.536	0.750	0.519	0.698
Japan	HIASIAPAC	0.750	0.600	1.329	0.742	0.417	0.653	0.935
Jordan	MIDDLEEAST	0.875	0.467	0.083	0.664	0.000	0.556	0.303
Kazakhstan	CENTRALASIA	0.875	0.850	0.141	0.846	0.500	0.813	0.678
Kenya	AFRICA	1.000	0.783	-0.227	0.560	0.833	0.583	0.574
Kiribati	EMASIAPAC	0.000	0.467	-0.770	0.491	0.333	0.534	0.000
Korea	HIASIAPAC	1.000	0.733	1.095	0.763	0.417	0.842	0.830
Kosovo	EMEUROPE	0.750	0.533	-0.277	0.781	0.917	0.657	0.603
Kuwait	MIDDLEEAST	0.750	0.583	-0.036	0.675	0.083	0.596	0.393
Kyrgyzstan	CENTRALASIA	0.750	0.667	-0.350	0.903	0.750	0.504	0.476
Laos	EMASIAPAC	0.750	0.317	-0.792	0.649	0.500	0.420	0.000
Latvia	EMEUROPE	1.000	0.317	1.190	0.815	0.750	0.717	0.596
Lebanon	MIDDLEEAST	0.750	0.417	-0.342	0.594	0.167	0.499	0.296
Lesotho	AFRICA	0.750	0.500	-0.497	0.583	0.417	0.572	0.369
Liberia	AFRICA	0.000	0.267	-0.971	0.311	0.750	0.352	0.405
Libya	AFRICA	0.000	0.250	-2.279	0.000	0.000	0.484	0.000
Lithuania	EMEUROPE	1.000	0.667	1.113	0.930	0.500	0.788	0.469
Luxembourg	HIEUROPE	0.000	0.483	1.757	0.639	0.250	0.733	0.455
Madagascar	AFRICA	0.750	0.517	-0.733	0.447	0.167	0.466	0.342
Malawi	AFRICA	0.875	0.500	-0.671	0.651	0.917	0.474	0.333
Malaysia	EMASIAPAC	1.000	0.817	0.682	0.804	0.583	0.682	0.672
Maldives	SOUTHASIA	0.625	0.433	-0.483	0.400	0.167	0.525	0.335
Mali	AFRICA	0.000	0.400	-0.550	0.515	0.500	0.428	0.435
Malta	EMEUROPE	0.625	0.617	1.337	0.489	0.167	0.676	0.381
Marshall Isl.	EMASIAPAC	0.000	0.267	-1.139	0.000	0.833	0.559	0.092
Mauritania	AFRICA	0.500	0.500	-0.811	0.613	0.167	0.604	0.000
Mauritius	AFRICA	0.875	0.750	1.027	0.787	0.500	0.704	0.691
Mexico	LATAMERICA	1.000	0.583	0.151	0.604	0.833	0.670	0.708
Micronesia	EMASIAPAC	0.000	0.250	-0.960	0.000	0.833	0.294	0.376
Moldova	EMEUROPE	0.750	0.683	-0.049	0.826	0.667	0.609	0.541
Mongolia	EMASIAPAC	0.875	0.683	-0.030	0.741	0.750	0.614	0.294
Montenegro	EMEUROPE	0.625	0.617	0.363	0.658	1.000	0.668	0.660
Morocco	AFRICA	0.875	0.600	-0.243	0.679	0.167	0.609	0.528
Mozambique	AFRICA	0.500	0.417	-0.726	0.529	0.083	0.398	0.469
Myanmar	SOUTHASIA	0.000	0.417	-0.753	0.523	0.167	0.398	0.469
Namibia	AFRICA	0.875	0.517	-0.052	0.402	0.417	0.634	0.370
Nepal	SOUTHASIA	0.000	0.583	-0.746	0.649	0.833	0.453	0.472
Netherlands	HIEUROPE	0.875	0.583	2.018	0.801	0.167	0.599	0.843

New Zealand	HIASIPAC	1.000	0.817	1.979	0.949	1.000	0.715	0.718
Nicaragua	LATAMERICA	1.000	0.350	-0.686	0.472	0.167	0.586	0.411
Niger	AFRICA	0.000	0.400	-0.640	0.581	0.500	0.538	0.394
Nigeria	AFRICA	1.000	0.667	-0.883	0.289	0.750	0.579	0.304
North Mace.	EMEUROPE	0.875	0.800	0.525	0.745	0.833	0.678	0.727
Norway	HIEUROPE	0.750	0.750	1.758	0.873	0.417	0.813	0.854
Oman	MIDDLEEAST	0.750	0.467	0.310	0.740	0.083	0.600	0.423
Pakistan	SOUTHASIA	0.875	0.717	-0.644	0.456	0.167	0.435	0.599
Palau	EMASIAPAC	0.000	0.267	-0.644	0.752	0.833	0.522	0.167
Panama	LATAMERICA	1.000	0.517	0.310	0.652	0.667	0.471	0.396
Papua NG	EMASIAPAC	0.625	0.550	-0.543	0.562	0.750	0.362	0.323
Paraguay	LATAMERICA	0.875	0.417	-0.124	0.661	0.083	0.579	0.413
Peru	LATAMERICA	1.000	0.633	0.518	0.749	0.583	0.607	0.457
Philippines	EMASIAPAC	0.000	0.433	0.046	0.576	0.083	0.460	0.552
Poland	EMEUROPE	1.000	0.617	0.882	0.761	0.583	0.644	0.765
Portugal	HIEUROPE	0.875	0.600	0.890	0.784	0.167	0.679	0.800
Qatar	MIDDLEEAST	0.875	0.283	0.515	0.833	0.083	0.528	0.381
Romania	EMEUROPE	0.875	0.600	0.445	0.750	0.750	0.723	0.599
Russia	EMEUROPE	0.875	0.617	-0.540	0.887	0.750	0.722	0.586
Rwanda	AFRICA	1.000	0.767	0.084	0.937	0.917	0.595	0.572
Saint Kitts	CARIBBEAN	0.000	0.483	0.511	0.288	0.417	0.655	0.000
Saint Lucia	CARIBBEAN	0.000	0.517	0.287	0.599	0.417	0.597	0.359
St. Vincent	CARIBBEAN	0.000	0.517	0.256	0.431	0.417	0.637	0.000
Samoa	EMASIAPAC	0.000	0.567	-0.115	0.695	0.750	0.586	0.335
Sao Tome	AFRICA	0.625	0.217	-0.846	0.411	0.000	0.288	0.000
Saudi Arabia	MIDDLEEAST	1.000	0.800	-0.046	0.816	0.083	0.634	0.000
Senegal	AFRICA	0.000	0.417	-0.108	0.575	0.500	0.482	0.443
Serbia	EMEUROPE	0.875	0.567	0.007	0.726	0.500	0.614	0.608
Seychelles	AFRICA	0.625	0.500	-0.149	0.708	0.167	0.513	0.522
Sierra Leone	AFRICA	0.000	0.550	-0.906	0.435	0.417	0.559	0.247
Singapore	HIASIPAC	0.875	0.800	2.132	0.831	0.667	0.845	0.743
Slovakia	EMEUROPE	0.875	0.533	0.811	0.902	0.583	0.661	0.669
Slovenia	EMEUROPE	0.750	0.700	0.695	0.721	0.250	0.548	0.837
Solomon Isl.	EMASIAPAC	0.000	0.500	-0.841	0.474	0.833	0.435	0.319
Somalia	AFRICA	0.000	0.000	-2.315	0.479	0.000	0.546	0.000
South Africa	AFRICA	0.875	0.733	0.172	0.593	0.417	0.541	0.545
South Sudan	AFRICA	0.000	0.267	-2.064	0.367	0.167	0.590	0.000
Spain	HIEUROPE	0.875	0.700	0.945	0.717	0.417	0.709	0.791
Sri Lanka	SOUTHASIA	0.750	0.667	-0.152	0.519	0.167	0.412	0.451
Sudan	AFRICA	0.000	0.350	-1.630	0.637	0.417	0.478	0.387
Suriname	LATAMERICA	0.000	0.350	-0.632	0.460	0.167	0.259	0.338
Sweden	HIEUROPE	0.625	0.683	1.800	0.901	0.500	0.676	0.795
Switzerland	HIEUROPE	0.750	0.500	1.780	0.861	0.500	0.641	0.627
Syria	MIDDLEEAST	0.250	0.533	-1.796	0.469	0.083	0.426	0.211
Taiwan	EMASIAPAC	1.000	0.750	1.356	0.839	0.167	0.751	0.771
Tajikistan	CENTRALASIA	0.875	0.667	-1.049	0.639	0.083	0.626	0.309
Tanzania	AFRICA	1.000	0.450	-0.613	0.501	0.417	0.617	0.390
Thailand	EMASIAPAC	0.875	0.750	0.112	0.695	0.583	0.679	0.766
Timor-Leste	EMASIAPAC	0.500	0.517	-0.786	0.000	0.000	0.061	0.000
Togo	AFRICA	0.000	0.400	-0.651	0.549	0.500	0.490	0.467
Tonga	EMASIAPAC	0.500	0.417	-0.351	0.446	0.833	0.573	0.340
Trinidad	CARIBBEAN	0.750	0.617	-0.021	0.467	0.583	0.356	0.485
Tunisia	AFRICA	0.875	0.567	-0.411	0.649	0.250	0.593	0.542
Turkey	MIDDLEEAST	1.000	0.717	-0.047	0.766	0.583	0.718	0.407
Uganda	AFRICA	0.875	0.500	-0.251	0.550	0.417	0.606	0.399
Ukraine	EMEUROPE	0.875	0.583	-0.220	0.697	0.667	0.636	0.317
UAE	MIDDLEEAST	1.000	0.750	0.932	0.909	0.500	0.759	0.497
UK	HIEUROPE	1.000	0.750	1.762	0.753	0.583	0.687	0.803
USA	NORAMERICA	1.000	0.647	1.578	0.769	0.917	0.726	0.909
Uruguay	LATAMERICA	1.000	0.433	0.499	0.576	0.333	0.563	0.530
Uzbekistan	CENTRALASIA	0.875	0.600	-1.103	0.666	0.500	0.673	0.452
Vanuatu	EMASIAPAC	0.500	0.500	-0.474	0.656	0.917	0.493	0.431
Venezuela	LATAMERICA	0.875	0.267	-2.334	0.519	0.083	0.469	0.186
Vietnam	EMASIAPAC	0.875	0.550	-0.386	0.711	0.667	0.621	0.349
Yemen	MIDDLEEAST	0.000	0.383	-1.536	0.652	0.000	0.525	0.000
Zambia	AFRICA	1.000	0.500	-0.443	0.491	0.917	0.508	0.424

Zimbabwe	AFRICA	0.750	0.533	-1.584	0.582	0.417	0.397	0.253
MEDIAN		0.750	0.533	-0.184	0.634	0.500	0.571	0.443

Linear regressions involving specified independent variables on the right-hand side of equations help to identify the relationship to credit access by firm size which serves as the dependent variable on the left-hand side of the equation. Regressions are conducted and repeated through the full cycle for total bank credit and long-term bank credit broken out by Income level (high-income versus emerging market), geographic Region, and Sector based on industrial classification code aggregations. In this regard, the “x” applied to the DEBT and LTD variables and the legal and institutional variables become more granular based on these more specific classifications or categories of data collected.

When hypotheses testing for listed or unlisted status of firms, the same approach is applied, measuring the relationship of the independent variables (firm size by listed and unlisted status) accounting for Income level, Region and Sector with credit access (dependent variable).

The designations for these additional categories in the equations and tests are “HI” for high-income, “EM” for emerging market, “LISTED” for listed (quoted), “UNLISTED” for unlisted (unquoted), “AG” for Agriculture, “RC” for Resources and Construction, “MA” for Manufacturing, and “SE” for Services. When regions are specified, the first three letters of the geographic region are used, resulting in “AFR” for Africa, “CAR” for Caribbean, “CEN” for Central Asia, “LAT” for Latin America, “MID” for Middle East, “SOU” for South Asia, and “NOR” for North America. As Asia-Pacific and Europe are split by income level as well, the designations for these are “HIAP” for high-income Asia-Pacific and “EMAP” for emerging market Asia-Pacific, and “HIE” for high-income Europe and “EME” for emerging market Europe. All of these designations applied to relevant equations are presented in tables below in discussions of subsection econometric specifications.

While Karafiath proposed the methodology for event studies focused on stock returns, the methodology can be applied to cross-sectional data to consolidate data related to dummy variables. As this is what the thesis is doing (e.g., relating legal/institutional and financial measures to estimates of credit access by firm size and correlating these with income grouping, geographic market, and industry/sector classification), the Karafiath methodology is a suitable and convenient approach. (Annex 2 presents a description of data collection and variables.)

C. Variable Selection in Relation to Theory and Research Objectives

Annex 1 provides a comprehensive list of variables identified in the Literature Review, while the Literature Review itself highlighted influences on the selection of variables. This subsection continues that discussion and relates the variables to the research methodology and general theory behind the research effort.

Put simply, the selected independent variables were intended to describe access to credit patterns (dependent variables) based on the research questions and hypotheses described above. The $DEBT_{i,x}$ and $LTD_{i,x}$ (dependent) variables were selected to benchmark firm-level credit access in general by firm size, as well as by all of the differing categories specified for the research. Several tables below present dollar values for dependent (and independent financial) variables. However, the regressions normalize the dependent variable by having total assets as a denominator. This approach was confirmed through

ANOVA testing (described in Section 4). Therefore, the dependent variables are proportional values relative to firm-level assets, rather than simply dollar value comparisons. This helps to address some of the large-scale firm bias in the sample by conducting the analysis on a relative basis by firm size (by share of assets), while univariate statistics (means procedure data) highlight distributions in absolute terms based on dollar values.

Independent variables were selected based on degree of perceived relevance to the research questions and hypotheses, as well as their perceived complementarity in terms of credit decision making, the role of collateral for secured transactions, and credit monitoring. They were also selected to reflect demand-side capacity of firms to borrow within the context of supply-side issues (and constraints) that influence credit allocation in economies. Therefore, the mix of financial variables is largely designed to indicate the level of financial capacity a prospective borrower has to access credit, while the legal and institutional variables are designed to reflect the business environment and incentives that influence lender decisions on whether to extend credit.

The Literature Review highlighted supply- and demand-side influences and how varied credit patterns can be in markets. Therefore, credit decision making financial independent variables were selected because of their widespread use in corporate finance journal articles addressing operating cash flow (Almamy et al., 2016; Aslan, 2016b; Ben-Nasr, 2016; Caneghem & Campenhout, 2012; Dasilas & Papasyriopoulos, 2015; Filipe et al., 2016; Ramalho & Vidigal, 2009; Traczynski, 2017) and financial slack (Bee & Abdollahi, 2013; Cenni et al., 2015; Chen, 2016), and their anticipated descriptive or explanatory power in relation to credit access for all categories. Meanwhile, the selection of credit information, minority shareholder rights and regulatory effectiveness as legal and institutional variables were influenced by observations from the literature focused on institutional theory (Beck, 2013; Behr & Sonnekalb, 2012; Berger & Black, 2011; Yunhao Chen et al., 2015b; Demirguc-kunt et al., 2004; Demirgüç-Kunt & Maksimovic, 1998; Doblas-Madrid & Minetti, 2013; Favara et al., 2017; Hernández-Cánovas & Koëter-Kant, 2010; Houston et al., 2012; Mac an Bhaire et al., 2016; Rajan & Zingales, 1998). In all cases, the selection of these credit decision making variables was made as if all credit were unsecured and independent of collateral considerations.

Notwithstanding these considerations, the Literature Review also highlighted the important role of collateral in secured transactions in all markets, including emerging markets. The important role of immovable and moveable property registration systems (Belkhir, Maghyereh, & Awartani, 2016b; Bharath et al., 2011; Ge et al., 2012; Kim et al., 2017; Lin et al., 2018) for secured transactions and the influence of institutional theory (Calomiris et al., 2017a; Godlewski & Weill, 2011; González, 2013b; Hall, 2012a; Houston et al., 2012; Lucey & Zhang, 2011) were particular drivers for variable selection. These variables are relevant for both supply-side and demand-side considerations. On the supply side, they relate directly to asset-based comfort for lenders in credit decision making. On the demand side, they send signals from borrowers that firms requesting credit are sufficiently confident about their commercial prospects to be able to pledge valuable properties with limited fear of having to transfer ownership to creditors.

More broadly, the review of tangible fixed assets that could be pledged as collateral for loans was considered complementary to the credit decision making variables. The research was unable to quantify the percentage of secured transactions to total, but a cursory estimate is that about half of credit is

secured. Therefore, the collateral and secured transactions independent variables needed to be sufficiently robust to meet research objectives without being overly repetitive of observations from the credit decision making variables since about half of credit is considered to be unsecured and not dependent on collateral.

The credit monitoring variables were selected because of their widespread use in corporate finance journal articles addressing loan principal coverage (Beyhaghi et al., 2017; Demiroglu & James, 2010; Denis & Wang, 2014a; Devos et al., 2012; Freudenberg et al., 2017; Prilmeier, 2017a) and interest coverage (Cenni et al., 2015; Devos et al., 2012; Kim et al., 2017; Murfin, 2012; Prilmeier, 2017a) as loan covenants and measures used by creditors to monitor credit quality once loans are originated. In this case, the financial variables reflect demand-side capacity to service and repay credit in a timely manner. However, their prominence as covenants in loan agreements also reflect the degree to which creditors perceive these variables to be predictors of credit performance. Therefore, the variables reflect information on supply-side measures taken by creditors to monitor performance and inform future decision making for credit allocation and portfolio structure. The importance of creditor protection and insolvency frameworks in the institutional theory literature (Acharya et al., 2010, 2011; Acharya, Amihud, & Litov, 2011a; Favara et al., 2017; González, 2013a; Jha et al., 2015; Öztekin, 2015) influenced the use of these variables to describe the importance of the legal and institutional environment.

The combination of these variables provides adequate context to test for the combined financial and legal and institutional impact of credit allocation. The Literature Review served as the basis for identifying key variables for testing.

D. Background Information on Dependent and Independent Variables

Table 5 below provides a description of the specific dependent and independent variables used in the research and how the variables were measured. Orbis BvD was the sole source of financial data for the two dependent variables and six financial independent variables, while the World Bank Group was the sole source of legal and institutional variable data used. Both entities operate on a global scale. The benefit of limiting information sources to two entities is that there is consistency in the methodologies used in the preparation of data across a large number of countries. References to SAS EG are for the logs generated in the program.

Table 5: Overview of Dependent Variables, Independent Variables and Category of Interest Dummy Variables

This table provides a description of all variables included in the research. Panel (1) describes the dependent variables. Panel (2) describes the legal and institutional independent variables. Panel (3) describes the financial independent variables. Panel (4) describes the category of interest dummy variables for income level, region, listed status and sector. Panel (5) describes additional variables used for firm size definitions and ratio analysis. Column (1) provides a description of each variable. Column (2) provides the unit of measure employed in the research. Column (3) provides the source. All financial variables are sourced from Orbis BvD and/or calculated based on data from Orbis BvD, including Total Assets used as denominator for DEBT, LTD, EBIT, FINSLACK, IMMOVEABLE and MOVEABLE ratios. The credit monitoring DEBT/EBITDA ratio is based on data sourced from Orbis BvD. IC ratios are sourced directly from Orbis BvD and not calculated. All legal and institutional framework variables are sourced from the World Bank Group (WBG). In six of seven cases, these are sourced from the 2019 Doing Business Indicators (DBI) report. In the case of the Regulatory Effectiveness indicator (REGEFF), the source is the WBG 2018 World Bank Governance Index. All logarithmic outputs are generated in SAS EG.

Panel 1: Dependent Variables			
	(1) Description	(2) Unit of Measure	(3) Source
<i>DEBT</i>	Bank debt and corporate bonds for those firms able to issue securities. Includes bank lines of credit ($LOC_{i,x}$), current maturities of long-term debt ($CMLTD_{i,x}$) and long-term debt ($LTD_{i,x}$). All DEBT ($DEBT_{i,x}$) is the numerator, and Total Assets ($TOAS_{i,x}$) is the denominator.	$DEBT_{i,x}/TOAS_{i,x}$	Orbis BvD
<i>logDEBT</i>	$logDEBT_{i,x}/TOAS_{i,x}$ is the log of $DEBT_{i,x}/TOAS_{i,x}$.	$logDEBT_{i,x}/TOAS_{i,x}$	SAS EG
<i>LTD</i>	Long-term bank debt and corporate bonds for those firms able to issue securities. Includes current maturities of long-term debt ($CMLTD_{i,x}$) and long-term debt ($LTD_{i,x}$). All LTD ($LTD_{i,x}$) is the numerator, and Total Assets ($TOAS_{i,x}$) is the denominator.	$LTD_{i,x}/TOAS_{i,x}$	Orbis BvD
<i>logLTD</i>	$logLTD_{i,x}/TOAS_{i,x}$ is the log of $LTD_{i,x}/TOAS_{i,x}$.	$logLTD_{i,x}/TOAS_{i,x}$	SAS EG
Panel 2: Legal and Institutional Independent Variables			
	(1) Description	(2) Unit of Measure	(3) Source
<i>CREDINFO</i>	Dummy variable for strength/weakness of credit information. Specifically sourced from the Depth of Credit Information section of "Getting Credit". Strong = 1 and applies to all scores above the median for rated countries. Weak = 0 and applies to all scores at or below the median for rated countries.	Scores derived from 0-8 scale used by the World Bank in scoring Depth of Credit Information (e.g., a score of "6" = 75%).	WBG DBI
<i>MINSH</i>	Dummy variable for strength/weakness of minority investor protection. Specifically sourced from "Protecting Minority Shareholders". Strong = 1 and applies to all scores above the median for rated countries. Weak = 0 and applies to all scores at or below the median for rated countries.	Scores based on 0-100 scale used by the World Bank.	WBG DBI
<i>REGEFF</i>	Dummy variable for strength/weakness of policies, regulations and implementation capacity in the business environment. Specifically sourced from "Regulatory Quality" worksheet. Strong = 1 and applies to all scores above the median for rated countries. Weak = 0 and applies to all scores at or below the median for rated countries.	Scores based on World Bank estimates of governance ranges from negative 2.5 (weak) to positive 2.5 (strong) governance performance).	WBG Governance Index
<i>PROPERTY</i>	Dummy variable for strength/weakness of immoveable property registration system for property and plant. Specifically sourced from "Registering Property". Strong = 1 and applies to all scores above the median for rated countries. Weak = 0 and applies to all scores at or below the median for rated countries.	Scores based on 0-100 scale used by the World Bank for "Registering Property".	WBG DBI

<i>LRINDEX</i>	Dummy variable for strength/weakness of moveable property registration system for machinery and equipment (including transportation). Specifically sourced from the Strength of Legal Rights Index section of “Getting Credit”. Strong = 1 and applies to all scores above the median for rated countries. Weak = 0 and applies to all scores at or below the median for rated countries.	Scores derived from 0-12 scale used by the World Bank in scoring Strength of Legal Rights Index (e.g., a score of “6” = 50%).	WBG DBI
<i>CONTRENF</i>	Dummy variable for strength/weakness of contract enforcement of credit agreements. Specifically sourced from “Enforcing Contracts”. Strong = 1 and applies to all scores above the median for rated countries. Weak = 0 and applies to all scores at or below the median for rated countries.	Scores based on 0-100 scale used by the World Bank for “Enforcing Contracts”.	WBG DBI
<i>INSOLV</i>	Dummy variable for strength/weakness of insolvency framework and how this affects creditor rights. Specifically sourced from “Resolving Insolvency”. Strong = 1 and applies to all scores above the median for rated countries. Weak = 0 and applies to all scores at or below the median for rated countries.	Scores based on 0-100 scale used by the World Bank for “Resolving Insolvency”.	WBG DBI
Panel 3: Financial Independent Variables			
	(1) Description	(2) Unit of Measure	(3) Source
<i>EBIT</i>	Earnings efficiency variable for one-year earnings before interest and taxes. <i>EBIT</i> ($EBIT_{i,x}$) is the numerator, and Total Assets ($TOAS_{i,x}$) is the denominator.	$EBIT_{i,x}/TOAS_{i,x}$	Orbis BvD
<i>logEBIT</i>	$logEBIT_{i,x}/TOAS_{i,x}$ is the log of $EBIT_{i,x}/TOAS_{i,x}$.	$logEBIT_{i,x}/TOAS_{i,x}$	SAS EG
<i>FINSLACK = NWC</i>	$FINSLACK_{i,x}$ is a variable for surplus financial resources available to firms, in this case reflected as Net Working Capital ($NWC_{i,x}$) as a share of Total Assets ($TOAS_{i,x}$). $NWC_{i,x}$ is equivalent to Current Assets less Current Liabilities.	$NWC_{i,x}/TOAS_{i,x}$	Orbis BvD
<i>logNWC</i>	$logNWC_{i,x}/TOAS_{i,x}$ is the log of $NWC_{i,x}/TOAS_{i,x}$.	$logNWC_{i,x}/TOAS_{i,x}$	SAS EG
<i>IMMOVEABLE</i>	$IMMOVEABLE_{i,x}$ is a variable reflecting the net value of property and plant after depreciation (as a share of assets). Not all firms report immoveable assets even when they report figures for Net Tangible Fixed Assets. This reduces the number of reporting firms in the sample. $IMMOVEABLE\ ASSETS_{i,x} = ((Net\ Stated\ Land/Total\ Assets) * 100) + ((Net\ Stated\ Buildings/Total\ Assets) * 100) = IMMOVEABLE\ ASSETS\ of\ firm\ i\ for\ category\ x;$ therefore, $NETLAND_{i,x} + NETBUILD_{i,x} = IMMOVEABLE\ ASSETS_{i,x}$	$IMMOVEABLE_{i,x}/TOAS_{i,x}$	Orbis BvD
<i>logIMMOVEABLE</i>	$logIMMOVEABLE_{i,x}/TOAS_{i,x}$ is the log of $IMMOVEABLE_{i,x}/TOAS_{i,x}$.	$logIMMOVEABLE_{i,x}/TOAS_{i,x}$	SAS EG
<i>MOVEABLE</i>	$MOVEABLE_{i,x}$ is a variable reflecting the net value of machinery and equipment after depreciation (as a share of assets). Not all firms report moveable assets even when they report figures for Net Tangible Fixed Assets. This reduces the number of reporting firms in the sample. $MOVEABLE\ ASSETS_{i,x} = ((Net\ Stated\ Plant\ \&\ Machinery/Total\ Assets) * 100) + ((Net\ Transportation\ Equipment/Total\ Assets) * 100) = MOVEABLE\ ASSETS\ of\ firm\ i\ for\ category\ x;$ therefore, $NETPPM_{i,x} + NETTRANSP_{i,x} = MOVEABLE\ ASSETS_{i,x}$	$MOVEABLE_{i,x}/TOAS_{i,x}$	Orbis BvD
<i>logMOVEABLE</i>	$logMOVEABLE_{i,x}/TOAS_{i,x}$ is the log of $MOVEABLE_{i,x}/TOAS_{i,x}$.	$logMOVEABLE_{i,x}/TOAS_{i,x}$	SAS EG
<i>DEBTBITDA</i>	Loan principal coverage variable commonly included in loan agreements as a covenant. All DEBT ($DEBT_{i,x}$) is the numerator, and Earnings before Interest, Tax, Depreciation and Amortization ($EBITDA_{i,x}$) is the denominator.	$DEBT_{i,x}/EBITDA_{i,x}$	Orbis BvD

<i>logDEBTEBITDA</i>	<i>logDEBT_{i,x}/EBITDA_{i,x}</i> is the log of <i>DEBT_{i,x}/EBITDA_{i,x}</i> .	<i>logDEBT_{i,x}/EBITDA_{i,x}</i>	SAS EG
<i>IC</i>	Interest coverage variable commonly included in loan agreements as a covenant. Ratios are sourced directly and not calculated. The definition from the source is Operating Profit/Interest Paid and is for the most recent annual period in both cases.	<i>OPPL_{i,x}/INTEXP_{i,x}</i>	Orbis BvD
<i>logIC</i>	<i>logIC_{i,x}</i> is the log of <i>IC_{i,x}</i> (= <i>OPPL_{i,x}/INTEXP_{i,x}</i>).	<i>logIC_{i,x}</i>	SAS EG
Panel 4: Category of Interest Dummy Variables			
	(1) Description	(2) Unit of Measure	(3) Source
<i>FIRM SIZE</i>	Small = annual OPRE between \$2-\$10 million	<i>SMALL_{i,x}</i>	Orbis BvD
	Medium= annual OPRE between \$10-\$50 million	<i>MEDIUM_{i,x}</i>	Orbis BvD
	Large= annual OPRE > \$50 million	<i>LARGE_{i,x}</i>	Orbis BvD
<i>INCOME</i>	Emerging market	<i>INCOME_{i,x1}</i> or <i>INCOME_{i,EM}</i>	Orbis BvD
	High-income	<i>INCOME_{i,x2}</i> or <i>INCOME_{i,HI}</i>	Orbis BvD
<i>REGION</i>	Africa	<i>REGION_{i,x1}</i> or <i>REGION_{i,AFR}</i>	Orbis BvD
	Caribbean	<i>REGION_{i,x2}</i> or <i>REGION_{i,CAR}</i>	Orbis BvD
	Central Asia	<i>REGION_{i,x3}</i> or <i>REGION_{i,CEN}</i>	Orbis BvD
	Emerging Market Asia-Pacific	<i>REGION_{i,x4}</i> or <i>REGION_{i,EMAP}</i>	Orbis BvD
	Emerging Market Europe	<i>REGION_{i,x5}</i> or <i>REGION_{i,EME}</i>	Orbis BvD
	High-Income Asia-Pacific	<i>REGION_{i,x6}</i> or <i>REGION_{i,HIAP}</i>	Orbis BvD
	High-Income Europe	<i>REGION_{i,x7}</i> or <i>REGION_{i,HIE}</i>	Orbis BvD
	Latin America	<i>REGION_{i,x8}</i> or <i>REGION_{i,LAT}</i>	Orbis BvD
	Middle East	<i>REGION_{i,x9}</i> or <i>REGION_{i,MID}</i>	Orbis BvD
	South Asia	<i>REGION_{i,x10}</i> or <i>REGION_{i,SOU}</i>	Orbis BvD
	North America (Canada and USA)	<i>REGION_{i,x11}</i> or <i>REGION_{i,NOR}</i>	Orbis BvD
<i>LISTED STATUS</i>	Listed = Quoted	<i>LISTED_{i,x1}</i>	Orbis BvD
	Unlisted = Unquoted	<i>UNLISTED_{i,x2}</i>	Orbis BvD
<i>SECTOR</i>	Agriculture	<i>SECTOR_{i,x1}</i> or <i>SECTOR_{i,AG}</i>	Orbis BvD
	Resources and Construction	<i>SECTOR_{i,x2}</i> or <i>SECTOR_{i,RC}</i>	Orbis BvD
	Manufacturing	<i>SECTOR_{i,x3}</i> or <i>SECTOR_{i,MA}</i>	Orbis BvD
	Services	<i>SECTOR_{i,x4}</i> or <i>SECTOR_{i,SE}</i>	Orbis BvD
Panel 5: Additional Variables			
	(1) Description	(2) Unit of Measure	(3) Source
<i>OPRE</i>	Operating Revenues which are used to define firm size.	<i>OPRE_{i,x}</i>	Orbis BvD
<i>logOPRE</i>	<i>logOPRE_{i,x}</i> is the log of <i>OPRE_{i,x}</i> .	<i>logOPRE_{i,x}</i>	SAS EG
<i>TOAS</i>	Total Assets which are used as a denominator for the two dependent variables and EBIT, NWC, IMM and MOV to compare results in regressions.	<i>TOAS_{i,x}</i>	Orbis BvD
<i>logTOAS</i>	<i>logTOAS_{i,x}</i> is the log of <i>TOAS_{i,x}</i> .	<i>logTOAS_{i,x}</i>	SAS EG
<i>TFA</i>	Total Fixed Assets = sum of IMM and MOV.	<i>TFA_{i,x}</i>	Orbis BvD

E. Data Collection, Processing and Statistical Testing

The data are collected to build cross-sectional units that are then tested by using linear regression analysis. Equations are presented in Sections 4-6 with testing specifications.

Univariate data are presented for context in sample frequency distributions and levels of credit access by firm size. These are derived from the financial accounting data by firm size to show the market distribution of credit access. Beyond the basic firm size context, the data also provide information by categories of interest (e.g., income level, region, listed status, sector).

Testing is based on linear regressions to assess relationships between independent variables and dependent variables. Among independent variables, legal and institutional values are based on scoring scales, while financial variables are generally converted to shares of assets (credit decision making and

pledged assets as collateral) or otherwise presented in calculated ratio form. Dependent variables for hypothesis testing were based on shares of assets due to their higher F-values in ANOVA tests for firm size effect (see Section 4).

Multivariate normality and goodness of fit were checked based on histograms, Q-Q plots and other plots. While many of the Q-Q plots appeared to show linearity, histograms, scatter plots and other plots showed this was not the case. The sample bias of the data set resulted in nearly two thirds of the Level 2 sample constituted by large-scale firms. These firms showed a large range of revenues, assets, debt and LTD, as reflected in the min-max data and standard deviations in the specific distributions. Means procedure data showcasing the distributions by category by lowest 1%, lowest quartile, median, upper quartile, and 99% show the striking effects of the largest 1% which alone skewed means. The upper quartile results also showed that means were highly skewed and that the models often failed to show equal variance.

Heteroscedasticity characterized all models, even after log transformation, although in log transformation models heteroscedasticity may have resulted from missing values. These patterns demonstrated that sample bias had a major effect on baseline results, while normality could not be achieved in many cases even after log transformation. This is not considered unusual for large cross-sectional samples, but it is inconsistent with the assumption of homoscedasticity in linear regressions. From a market perspective, the data and distributions also demonstrated the high level of market power enjoyed by these firms. However, from a statistical perspective, the data also meant that the sample was skewed. Skewness was also evident within firm size boundaries for SMEs, as mean results for small and medium-sized firms were generally greater than median results in the specific firm size distributions.

Robustness tests were originally run to determine whether coefficient estimates would greatly differ if based on a normal distribution. The first step of original testing was to test the baseline data for skewness and kurtosis, and then to winsorize and trim means of financial independent variables to modify and delete the impacts of outliers. The initial approach assumed that by first adjusting for the top 1% (99% cohort in the means procedures) through winsorization and more boldly through trimmed means, that outliers would be removed from the sample. This was not the case, so the second step was to move to the upper quartile. Once it was determined that even trimmed means of the upper quartile would not eliminate outliers or achieve a normal distribution, it was determined that a different approach was required. (Annex 3 presents the results of all winsorization and trimmed means tests.) This culminated in a revamping of the approach to more systematically test for firm size effect based on a single consolidated equation, followed by subsequent testing by categories of interest (all discussed in Section 4) and robustness tests (described in Sections 5 and 6).

As noted in discussion of the selection of variables and the original research tests based on Daskalakis et al (2014), an effort was made to avoid problems of collinearity and multicollinearity. This is one of the reasons for the original segmented approach based on *ex-ante*, collateral, and *ex-post* variables. The selection criteria for these variables included (1) prominence in the literature, (2) expected effectiveness as independent variables in describing the relationship to the dependent variables, and (3) complementarity with other independent variables in the other two segments so that a combined single equation of all variables or all financial variables would not suffer from unacceptable levels of collinearity or multicollinearity. Multicollinearity in the original segmented approach was tested by using Pearson correlations and reviewing Variance Inflation values (VIV) and Tolerance estimates. In the end, most

models show favorable collinearity results. However, other issues were problematic in terms of statistical significance and heteroscedasticity. This led to the revamped approach to testing (detailed in Sections 4-6), resulting in use of the GLM ANOVA procedure for unbalanced samples and a more consolidated method to test for firm size effect by category of interest.

As a general rule, models are rejected when issues of collinearity or multicollinearity emerge. When one or two firm size dummy variables or independent variables are not statistically significant, these results are acknowledged and may contribute to support for or rejection of relevant hypotheses.

F. Data and Sample

1. *Sample Data and Distribution Challenges*

The data collected are based on the latest annualized financial data available from sample firms. Therefore, the research is based on the use of cross-sectional data, not time series data. While a limiting factor for the research due to the absence of time series data, one benefit of this approach is that autocorrelation risk is nil.

Heteroscedasticity tests were used to test residuals. In the null hypothesis, the variance is constant. If the p-value is small based on the p-value t-statistic or chi-square threshold, the null hypothesis is rejected and the alternative hypothesis that the variance is not homoscedastic (equal or constant variance) is accepted. Heteroscedasticity was tested for the six financial variables by using a White Test for heteroscedasticity and checking that variances of the residuals are equal across the regression line. Because of the sample bias issues noted above, this was generally not the case in the sample distributions. Even log transformations showed rejection of the null hypothesis based on statistical significance results for chi-squares based on Test of First and Second Moment Specification. Scatter plots generally showed residuals to not cluster around the regression line. Therefore, the data pointed to non-linear relationships. These are referenced in each of the baseline and log transformation regression results. (Annex 4 summarizes regression test diagnostics for heteroscedasticity.)

Because the research aspired to profile SME credit access in relation to large-scale firm access globally, working with unadjusted sample data was considered important as a reflection of market reality. At the same time, recognizing that sample bias and the dominance of large-scale firms in most categories significantly skewed the data, analysis and results, additional tests were carried out in the form of robustness tests to estimate coefficients and better describe the relationships of the independent variables to dependent variables under normally distributed conditions. The log transformations represent these tests, with sample sizes considerably smaller than the unadjusted Level 2 sample. Log transformation results for the six independent financial variables showed high R-squares (exceeding 0.90), but results are taken with caution because of the presence of heteroscedasticity in these models due to the high volume of missing observations.

Therefore, the dual approach represents an effort to carry out the research based on a combination of market reality (unadjusted sample test results) and then statistical norms (log transformation results) based on assumptions of linearity, multivariate normality, homoscedasticity, and an absence of autocorrelation and (multi)collinearity. The analysis discusses the results of each approach, similarities and differences in coefficient estimates, and the implications of these results for the broader research questions and hypothesis tests. However, in the end, the results are affected by sample bias and distributions do not meet assumptions of linearity, multivariate normality or homoscedasticity.

2. *Level 2 Sample Data Summary*

The data set is composed of financial accounting data for 31,414 firms sourced from Orbis BvD. (The number varies based on variable reported.) The data were collected in 2018, and almost all data (97%) are from 2017 or 2018. A small number of firms in the sample (3% of total) presented data from 2014-2016. Therefore, while there is sample bias in favor of large-scale firms, the data are not considered to be contaminated by the effects of the financial crisis of 2008-2009. Table 6 below briefly summarizes the representation of data for firms by year of reporting. (Seven firms did not specify the year of reporting.)

Table 6: Level 2 Sample of Firms by Year of Financial Reporting

This table presents the distribution of Level 2 sample firms included in the research. Column (1) is the year of financial accounting disclosure, which was the last year of financial data available at the time of collection. Column (2) is the number of firms for each year. Column (3) is the percent of total represented by number of firms per reporting year. Column (4) sums the total revenues of firms per year of reporting. Column (5) presents the distribution of revenues by year of reporting.				
(1) Year	(2) No. of Firms	(3) % of Firm Total	(4) Revenues (\$, thousands)	(5) % of Total Revenues
2014	260	1%	306,493,212	1%
2015	399	1%	378,293,215	1%
2016	759	2%	513,219,963	1%
2017	27,526	88%	38,568,773,747	88%
2018	2,463	8%	3,849,474,202	9%
Total	31,407	100%	43,616,254,339	100%

Frequency distributions presented in Table 7 show a total of 31,134 firms in the Level 2 sample. Only 11% of firms in the sample are “small”, with annual revenues of less than \$10 million. Another 27% are “medium”, with annual revenues of \$10 million to \$50 million. (Both of these shares are lower than the 39% and 40% respective shares in the Level 1 sample.) “Large” firms with annual revenues exceeding \$50 million account for nearly two thirds (62%) of the total Level 2 sample (much more than the 21% in the Level 1 sample). Therefore, there is a clear sample bias in favor of large-scale firms that reflects their disproportionately greater level of publicly reported financial data. Combined with the data being latest year available at the time of collection as opposed to time series data, sample bias represents the greatest problem associated with the sample and data collected. Nonetheless, the sample is large, includes a significant number of SMEs, and constitutes a single source of SME data that is global in scope. Therefore, the sample is useful in the effort to profile credit access patterns by firm size around the globe.

Sample characteristics of firms included by firm size are presented in Table 7 below for firms reporting relevant data by category. The aggregate number of firms is slightly lower than those recorded in the full Level 2 sample due to non-reporting of specific categories related to income level, listed status and/or sector of economic activity.

Table 7: Sample Statistics

This table presents the distribution of Level 2 sample firms. Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by listed status. Panel (4) presents all firms in total and by firm size by sector. Column (1) is all firms by number and share of total. Column (2) is small-scale firms by number and share of total. Column (3) is medium-sized firms by number and share of total. Column (4) is large-scale firms by number and share of total. Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	No.	%	No.	%	No.	%	No.	%
All Firms	31,134	100%	3,282	11%	8,467	27%	19,385	62%
Panel 2: All Firms by Income Level								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	No.	%	No.	%	No.	%	No.	%
High Income	15,933	51%	2,572	8%	2,807	9%	10,554	34%
Emerging Markets	15,201	49%	710	2%	5,660	18%	8,831	28%
Panel 3: All Firms by Listed Status								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	No.	%	No.	%	No.	%	No.	%
Listed	29,229	94%	3,096	10%	7,970	26%	18,163	58%
Unlisted	1,905	6%	186	1%	497	2%	1,222	4%
Panel 4: All Firms by Sector								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	No.	%	No.	%	No.	%	No.	%
Agriculture	597	2%	101	0%	206	1%	290	1%
R&C	2,491	8%	340	1%	536	2%	1,615	5%
Manufacturing	14,934	48%	1,393	4%	4,018	13%	9,523	31%
Services	13,096	42%	1,446	5%	3,698	12%	7,952	26%

As noted, this Level 2 frequency distribution reflects a higher level of disclosure of financial information from larger firms than other firms, often because the latter are listed on stock exchanges and are required to publicly disclose financial accounting information. Smaller and unlisted firms are not under such pressure, and consequently do not usually willingly disclose such information. This is reflected in the small number of small-scale firms (3,280) in the Level 2 sample, accounting for only 11% of total. When SMEs do disclose financial information voluntarily, they are typically listed on a stock exchange and are large enough to be contemplating an equity issue to be sold through an exchange (Lardon & Deloof, 2014). Therefore, they are not considered typical or representative of SMEs. Only 683 unlisted SMEs are included in the sample, a microscopic fraction of the Level 1 sample and only 3% of the Level 2 sample.

3. Data Limitations

There are several limitations to the data set, some of which have already been mentioned. The general data limitations influenced the selection of independent (explanatory) variables for hypothesis testing.

First, for all firms, financial accounting data are from the last period reported, not time series. Therefore, they represent static snapshots of financial position, not trends. In practice, creditors/lenders do not focus on just one year of performance firm when determining whether to grant loans to SMEs. Rather, time series of data are used to make these decisions (e.g., three years of audited financial statements), particularly for decisions involving long-term debt. As discussed in Findings and Observations (Section 7), recommended future research includes accessing time series data in emerging markets (and other) SMEs where (a) earnings and cash flow variability, changes in fixed and total assets, trends in short-term and

long-term borrowings, and other fundamental indicators and values can be measured and assessed, and (b) independent financial variables can be fine-tuned for more informed analysis.

A second limitation is the relative weight of large-scale firms, which constitute 62% of the sample. This stands in contrast to the 21% figure from the Level 1 data, which more accurately reflects the number of large-scale firms with annual revenues exceeding \$50 million. However, as a sizeable number of large-scale firms are also listed firms, they disclose their financial accounting data more than SMEs. This results in sample bias that skews the distribution of the Level 2 sample data. This distorts the results of the data analysis, but also reflects the significant economic power of large-scale firms in the market compared to SMEs.

A third limitation is an extension of the first two and applies specifically to SMEs. The number of SMEs disclosing financial accounting information on a voluntary basis is small and well below levels for large-scale firms. The Level 1 sample includes revenue figures for 945,787 SMEs, of which only 11,749 disclosed information beyond basic high-level indicators like revenues or total assets for Level 2 uses. This is equivalent to 1% of SMEs. In contrast, 19,385 Level 2 large-scale firms made data available, equivalent to 8% of the Level 1 pool of 248,956 large-scale firms. Extending the definition of SMEs to firms with annual revenues of \$1-\$2 million would shrink the disclosure percentage further. Therefore, data limitations for the sample are even more severe for SMEs.

These general limitations also apply to secured transactions (e.g., lack of time series data that would apply to fixed asset values that could be pledged as collateral, the role of depreciation of fixed assets and new capital expenditure in cash flow calculations). Beyond this, the most severe data limitation for the discussion of pledged assets and collateral for secured transactions is that the share of secured transactions to total credit is not available. One study of 15 countries (of which 13 are aligned with the definition of emerging markets in this thesis and only two, Korea and Singapore, are considered high-income markets) has developed a model that estimates collateralization rates (pledged asset values divided by approved loan values) at 54% (Liberti & Mian, 2010). OECD data (presented in graphic form from 2014-2016, and not tables) suggests there is major variability in collateral requirements for SMEs in mainly high-income markets, ranging from about 10% in France to more common ranges of 40% to 85%, with some markets at 100%. Apart from France, the graphic of 18 countries shows the minimum is about 35%-40%, and that the normal range is generally at or above the 54% figure mentioned above (*Financing SMEs and Entrepreneurs, OECD, 2018*). For instance, in Japan, the range is in the 75%-80% range for SME loans (Uchida, 2011).

Being able to access any distribution in pledged assets between immoveable and moveable assets is challenging in any market, let alone globally, as the figure is constantly moving and recorded differently across markets. Data from the OECD for asset-based financing and how this relates to SME loans combines assets (e.g., accounts receivable, inventory, real estate, equipment) that are used as collateral for such loans, rather than breaking them out by type of asset. In many of these markets, collateral requirements are not even reported. These limitations are partly managed by assuming that assets that are not explicitly pledged as collateral for loans are implicitly collateralized through loan covenants that restrict investment, asset sales or additional borrowings (Rampini & Viswanathan, 2013). However, this does not solve the problem associated with the use of snapshot data based on the latest year of financial accounting data

available, nor does it solve the problem of lower levels of reporting of fixed assets. As shown in the sample data, some firms report net tangible fixed assets, but do not break these out between immoveable and moveable fixed assets. Recommended future research would benefit from studies that access time series data for immoveable and moveable assets of SMEs to better assess how the pledging of these assets by borrowers can influence SME access to short-term and long-term borrowings.

There is also the risk that book values for TFA, IMM and MOV understate values for IMM which would otherwise be higher in many cases based on more current market valuations of commercial properties. The effect would be an understatement of these values, thereby overstating the relative importance of MOV. As large-scale firms have greater IMM assets in absolute value, the effect of book valuations is to understate additional asset-based power of large-scale firms in the market, thereby understating the importance of IMM as an independent variable in relation to credit and LTD access.

Data limitations for credit monitoring derive from the limitations described above. Because the financial accounting data represent static snapshots of financial position, not trends, the impact of longstanding bank-borrower relationships on loan terms (e.g., amounts, pricing) and financial covenants cannot be assessed in comparison with transactional lending patterns. In particular, as lenders use multi-year data in making their credit decisions, they also use multi-year data to estimate which loan covenants to include in credit agreements with borrowers. As SMEs are diverse across markets and sectors of activity, lenders typically need time series data to estimate firm-level EBITDA for principal coverage, firm-level operating profitability for interest expense coverage, and other data sets relevant for the specific covenants included in loan agreements. This is particularly important for the monitoring of credit performance that is long-term and unsecured.

A second limitation for credit monitoring is the multiplicity and dispersion of covenants, which makes it difficult to fine-tune the assessment of covenants in relation to more precise characteristics of borrowers. As noted elsewhere, lenders typically have three to 10 loan covenants in their credit agreements with borrowers (Demiroglu & James, 2010), and many of these are based on sensitivity analyses, scenario analysis, and projections of how the firm will performance based on both exogenous (e.g., macroeconomic, sector-level competition) and endogenous (e.g., firm-specific) factors. Therefore, having time series data is needed in practice for lenders. As the research is only based on the most recent financial accounting data reported by firms, this constitutes a limitation.

IV. Statistical Tests and Results—SME Firm Size Effects on Credit Access

A. Background

This section addresses the main research question:

- Is credit access positively correlated with firm size in all markets and sectors, or are there deviations from this?

This provides clarity on the links between firm size assumptions in relation to the dependent variables and addresses Hypothesis 1 while also serving as overarching context for the subsequent hypotheses relating to firm size effects by category of interest in relation to credit access. By extension, the baseline regression then tests for categories of interest in relation to credit access, as well as a full array of independent variables—financial and legal and institutional. Therefore, this section addresses all seven hypotheses in one form or another subject to statistical significance and collinearity diagnostics. The hypotheses are tested by providing financial figures from the sample data and running out firm size and credit access distributions from the univariate data, followed by ANOVA (GLM procedure), regression analysis and two-pairwise *t*-tests to compare credit and LTD access by firm size.

First, univariate statistics for credit access patterns are presented based on dollar values and shares of total assets by firm size. Mean and median values by firm size allow for a testing of the hypothesis in general as well as by income, region, listed status and sector. The means distribution for access to credit, including long-term credit, shows mean values by firm size in the distribution at 1%, 25%, 50%, 75% and 99% quintiles. Variances in the distributions are run to confirm observations.

This is followed by a GLM procedure which conducts ANOVA for unbalanced samples. Given the sample bias of the Level 2 sample, with 62% of firms being considered large and only 38% constituted by SMEs, this approach suited to determining F values for the three Revenue Quantiles as well as for interactive categories being evaluated (i.e., income, region, listed status, sector). These are carried out with DEBT, DEBT/ASSETS, LTD and LTD/ASSETS all as dependent variables. High F values and statistical significance help to determine the suitability of models to be used in hypothesis testing.

The next step involves comparing coefficients of credit access by firm size based on the revenue quantile definitions used in this research for small, medium and large, and then creating the two associated dummy variables (“SMALL” and “MEDIUM”) to test for firm size effect in relation to the third firm size category. This is first carried out for all credit and LTD access, and then carried out for all other categories of interest (e.g., income level, region, listed status, sector). The test starts with running the aggregated model on the full sample only, allowing the coefficients to vary between small, medium, and large firms by using category dummies and interactive terms with the dummies. The results provide the impetus for increasingly disaggregated comparisons of the sample by size by the specific categories of interest as reflected in Hypotheses 2-7. As a general rule, models are rejected when issues of collinearity emerge. When one or two firm size dummy variables or independent variables are not statistically significant, these results are acknowledged and may contribute to support for or rejection of relevant hypotheses.

Because variables cannot be compared across multiple regressions if data subsets have different variances, each test is run in a singular equation to determine whether size differentials are significant. F-values are presented to determine whether the variances across firm size samples are the same, and then to determine whether the difference across size (or any of the other variables) are significant.

The final step is to conduct 2-pairwise t-tests for different firm sizes to test the mean differences of credit and LTD access across the three firm sizes based on revenue quantiles. Pairwise differences between firm sizes combined with observations from ANOVA and regressions then serve as justification for testing the subsequent hypotheses.

B. Univariate Data on SME Access to Total Bank Credit

1. Total Credit Access in Dollar Value

Tables 8-9 below profile SME (and large firm) access to bank finance, including long-term credit. The number of firms reporting revenues was 31,134, of which 26,599 report having access to credit. The number of firms with access to bank credit by firm size is 2,417 for small, 6,759 for medium, and 17,423 for large. Therefore, SMEs account for 34% of firms in the sample with access to total bank credit, lower than the share of SMEs in the Level 2 sample reporting revenues (38%). The share of SME access to LTD is even lower at 30%. These observations are consistent with the firm size bias of the hypotheses. Table 8 briefly summarizes credit access distributions by firm size in the Level 2 sample.

Table 8: Overview of Frequency Distribution of SME Firms with Access to Bank Credit

This table presents summary frequency distribution data for the Level 2 sample of firms and their access to credit. Column (1) presents the total number of firms by firm size that reported having access to credit. Column (2) presents the share of firms by firm size that reported having access to credit. Column (3) presents the total number of firms by firm size that reported having access to long-term credit. Column (4) presents the share of firms by firm size that reported having access to long-term credit.				
	(1) Total w/Credit	(2) % of Total	(3) Total w/LTD	(4) % of LTD
>\$50 million = Large	17,423	66%	15,469	70%
\$10-\$50 million = Medium	6,759	25%	4,808	22%
\$2-\$10 million = Small	2,417	9%	1,808	8%
Total	26,599	100%	22,085	100%
o/w SMEs	9,176	34%	6,616	30%

The specification of total bank credit in this case is consistent with the $DEBT_{i,t}$ dependent variable described above. Note that “bank credit” is defined as total interest-bearing debt, including lines of credit, current maturities of long-term debt, and long-term debt on which interest expense is paid. As the criteria include all interest-bearing instruments, this also includes corporate bonds and other debt instruments that some firms in the sample can issue as a substitute for bank debt.

Table 9 shows the distribution of firm access to total bank credit indicates the mean (average) is higher in all three broad categories than the median figure. This suggests there is skewness towards larger exposures in all three firm size categories. This is particularly the case for large-scale firms where there are no upper bounds in the definition. The mean is about \$300 million in credit per large-scale firm in the Level 2 sample, although the median figure is about \$40 million. The mean-to-median multiplier is about 1.5 times in the other quantiles. Median borrowings exceeded \$4 million for medium-sized firms and were less than \$1 million for small-scale firms. These data provide considerable direct support for Hypotheses 1, 3, 4 and 6 and the premise that there is positive correlation between firm size and credit access.

The above patterns are found to be true by income level, although emerging markets show higher mean and median figures for small-scale firms than their high-income counterparts. Emerging markets' mean-to-median multipliers for large-scale credit are also lower than multipliers in high-income markets, suggesting there may be less concentration of credit with the largest firms in emerging markets. Regional and sector patterns are largely consistent with the above, as are patterns for listed and unlisted firms. These patterns generally support the premise of positive correlation between firm size and credit allocation, although the lack of uniformity in income level patterns also shows the pattern is not completely linear.

Table 9: Firm Access to Bank Credit by Dollar Value

This table presents mean and median credit (DEBT) for sample firms in thousands of dollars. Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms by mean and median. Column (2) is small-scale firms by mean and median. Column (3) is medium-sized firms by mean and median. Column (4) is large-scale firms by mean and median. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All Firms	190,152	14,605	1,436	849	6,805	4,422	300,922	40,458
Panel 2: All Firms by Income Level								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
High Income	335,476	26,813	1,191	774	5,804	3,818	441,610	52,772
Emerging Markets	71,419	9,447	1,498	876	7,290	4,798	132,848	31,559
Panel 3: All Firms by Geographic Region								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Africa	57,778	9,589	1,680	937	6,082	3,613	96,275	28,080
Caribbean	71,378	3,423	990	593	1,661	1,685	139,573	15,797
Central Asia	20,857	2,842	625	348	3,657	2,737	52,531	13,962
EM-Asia/Pacific	67,930	10,112	1,395	878	8,122	5,578	130,334	28,716
EM-Europe	53,481	4,012	994	673	4,653	2,978	117,535	22,452
HI Asia-Pacific	248,629	25,656	1,300	781	6,199	4,233	319,740	44,633
HI Europe	354,240	23,175	1,267	889	5,689	3,775	497,556	59,449
Latin America	136,463	27,443	905	451	5,608	4,100	184,386	53,331
Middle East	100,705	15,619	2,185	1,173	7,882	4,973	165,562	42,727
South Asia	62,900	6,916	1,889	1,073	4,937	2,941	116,678	34,794
North America	494,115	35,484	965	604	4,974	3,004	632,363	67,897
Panel 4: All Firms by Listed Status								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Listed	192,477	14,615	1,445	855	6,899	4,491	305,276	40,615
Unlisted	152,798	14,449	1,271	653	5,225	3,227	233,573	38,547
Panel 5: All Firms by Sector								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Agriculture	39,772	5,676	719	372	5,264	3,194	77,828	20,084
R&C	225,798	17,452	2,243	1,126	6,747	3,713	339,720	49,831
Manufacturing	198,623	17,550	1,534	975	7,059	4,972	307,635	43,780
Services	180,754	11,797	1,215	743	6,619	3,918	293,191	35,712

The distribution of firm access to total bank credit indicates a very high level of credit to the largest firms in the top 1% of the distribution, where the norm exceeds \$3 billion. Altogether, median credit for all firms in the Level 2 sample is nearly \$15 million, with the lowest quarter mean at less than \$4 million and the highest quarter average exceeding \$63 million.

High-income markets show considerably higher medians than emerging markets, at about three times. These relationships increase as percentiles increase to the upper quartile. There is little difference between listed and unlisted firms in the sample. By sector, R&C and Manufacturing show the largest medians, with the former being the largest in the upper quartile.

The mean values, upper quartiles and 99th percentile show the impact and distortionary effect of outliers on means. Means are significantly greater than medians in all categories. Standard deviations reflect the wide dispersion of credit access in the sample, particularly in high-income markets and among listed firms. The dispersions hold true in most sectors, with only Agriculture showing lower dispersion. Table 10 below presents the means procedure distributions by firm size, income levels, listed and unlisted status, and sector.

Table 10: Means Procedure for Distribution of Access to Bank Credit and Corresponding Credit Values

This table presents the means procedure for distribution of credit access (DEBT) for the sample firms. Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms according to the relevant panel by number, mean and standard deviation. Column (2) is the corresponding percentile distribution from 1st to 99th. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99. All figures are in thousands of dollars apart from number of firms (n) and Standard Deviation (St. Dev.).

Panel 1: All Firms								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
All Firms	30,526	190,152	1,150,179	23	3,522	14,605	63,406	3,320,002
o/w Small	3,127	1,436	3,114	0	328	849	1,669	10,358
o/w Medium	8,255	6,805	9,439	14	1,989	4,422	8,532	38,562
o/w Large	19,087	300,922	1,443,259	211	14,870	40,458	142,358	4,967,592
Panel 2: All Firms by Income Level								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
HI	13,726	335,476	1,630,528	38	6,281	26,813	128,411	5,852,199
o/w Small	632	1,191	2,036	0	325	774	1,433	8,461
o/w Medium	2,697	5,805	8,227	10	1,903	3,818	7,222	35,415
o/w Large	10,390	441,610	1,861,708	335	17,800	52,772	229,830	7,120,000
EM	16,800	71,419	447,599	12	2,363	9,447	34,648	1,075,091
o/w Small	2,495	1,498	3,329	0	328	876	1,734	11,112
o/w Medium	5,558	7,290	9,939	15	2,048	4,798	9,315	39,083
o/w Large	8,697	132,848	615,734	132	12,333	31,559	89,633	1,677,929
Panel 3: All Firms by Listed Status								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
Listed	28,737	192,477	1,172,776	26	3,549	14,615	63,437	3,385,057
o/w Small	2,963	1,449	3,158	0	338	855	1,675	10,085
o/w Medium	7,789	6,899	9,535	17	2,041	4,491	8,617	38,562
o/w Large	17,928	305,276	1,473,372	216	14,911	40,615	142,320	5,034,660
Unlisted	1,789	152,798	691,755	0	3,146	14,449	61,996	2,050,000
o/w Small	164	1,271	2,163	0	184	653	1,543	11,448
o/w Medium	466	5,225	7,488	0	1,065	3,227	6,446	43,324
o/w Large	1,159	233,573	848,701	99	14,423	38,547	147,718	2,761,396
Panel 4: All Firms by Sector								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
Agriculture	586	39,772	157,033	5	1,075	5,676	21,308	489,933
o/w Small	100	719	1,315	0	138	372	943	7,605
o/w Medium	200	5,264	6,751	33	1,080	3,194	6,698	37,897
o/w Large	285	77,828	218,924	24	7,456	20,084	51,437	1,223,311
R&C	2,362	225,798	1,063,513	1	3,163	17,452	91,310	3,910,969
o/w Small	297	2,243	4,374	0	482	1,126	2,408	35,594
o/w Medium	500	6,747	8,891	4	1,495	3,713	8,266	48,530
o/w Large	1,558	339,720	1,294,964	55	15,898	49,831	193,173	5,042,297
Manufacturing	14,818	198,623	1,286,786	53	4,698	17,550	69,287	3,477,969
o/w Small	1,361	1,534	3,229	0	401	975	1,766	10,782
o/w Medium	3,960	7,059	9,844	37	2,465	4,972	8,828	33,746
o/w Large	9,469	307,635	1,599,473	595	17,723	43,780	144,854	4,938,111
Services	12,744	180,754	1,015,579	12	2,706	11,797	54,717	3,033,609
o/w Small	1,367	1,215	2,701	0	270	743	1,528	9,089
o/w Medium	3,586	6,619	9,175	4	1,668	3,918	8,247	44,939
o/w Large	7,770	293,191	1,288,139	149	11,804	35,712	135,437	5,109,016

2. Access to Credit by Firm Size as a Share of Total Assets

As a share of total assets, patterns presented in Table 11 show that mean-to-median DEBT ratios are highest for small-scale firms (nearly two times), lower for medium-sized firms (1.3 times), and even lower for large-scale firms (1.1 times). While the specific multipliers differ, these general patterns by firm size hold by income level, region, listed status and sector. This means that average credit levels as a share of assets are highest for small-scale firms and lowest for large-scale firms, indicating that there is an inverse relationship between firm size and credit access on a relative basis. This is inconsistent with underlying premise of the research, and indicates additional hypothesis testing is required to confirm or refute Hypothesis 1 and, by extension, Hypotheses 3, 4 and 6.

Table 11: Firm Access to Bank Credit as a Share of Firm Level Assets

This table presents mean and median credit for sample firms as a share of firm-level assets (DEBT/ASSETS). Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms by mean and median. Column (2) is small-scale firms by mean and median. Column (3) is medium-sized firms by mean and median. Column (4) is large-scale firms by mean and median. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All Firms	0.253	0.201	0.359	0.183	0.225	0.168	0.249	0.218
Panel 2: All Firms by Income Level								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
High Income	0.245	0.198	0.411	0.192	0.238	0.160	0.239	0.205
Emerging Markets	0.261	0.205	0.347	0.180	0.219	0.170	0.263	0.233
Panel 3: All Firms by Geographic Region								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Africa	0.230	0.184	0.257	0.166	0.257	0.199	0.212	0.184
Caribbean	0.162	0.138	0.193	0.138	0.103	0.057	0.171	0.162
Central Asia	0.309	0.207	0.307	0.114	0.275	0.148	0.317	0.294
EM-Asia/Pacific	0.230	0.186	0.329	0.156	0.197	0.157	0.241	0.217
EM-Europe	0.286	0.183	0.402	0.144	0.256	0.173	0.245	0.206
HI Asia-Pacific	0.204	0.169	0.230	0.167	0.217	0.168	0.201	0.169
HI Europe	0.261	0.215	0.341	0.163	0.273	0.182	0.250	0.225
Latin America	0.303	0.284	0.279	0.221	0.259	0.218	0.316	0.297
Middle East	0.265	0.222	0.238	0.147	0.243	0.183	0.280	0.256
South Asia	0.341	0.267	0.369	0.257	0.294	0.261	0.329	0.277
North America	0.305	0.248	0.656	0.269	0.230	0.105	0.300	0.266
Panel 4: All Firms by Listed Status								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Listed	0.248	0.198	0.349	0.178	0.219	0.163	0.245	0.215
Unlisted	0.338	0.270	0.530	0.273	0.331	0.256	0.317	0.276
Panel 5: All Firms by Sector								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Agriculture	0.259	0.227	0.249	0.146	0.245	0.206	0.273	0.263
R&C	0.276	0.208	0.384	0.165	0.278	0.181	0.258	0.217
Manufacturing	0.246	0.197	0.405	0.199	0.225	0.175	0.232	0.205
Services	0.258	0.205	0.314	0.163	0.215	0.148	0.267	0.235

The distribution of firm access to total bank credit as a share of total assets presents a different picture. On the one hand, small-scale firms typically show higher averages on a vertical basis in total, and by income level, region, listed status and sector apart from Agriculture.

On the other, a comparison of distributions by percentile show differing patterns. For instance, large-scale firms have the highest share of credit to total assets in the bottom quartile and bottom half. At 1%, all firm sizes show 0%. However, in the upper quartile and at 99%, small-scale firms have the highest mean ratios. Therefore, the results for small-scale firm averages are largely influenced by the upper 25% of small-scale firms. This is not consistent with Hypothesis 1. There are also patterns that show some deviation from the norm, such as the upper quartile of emerging markets, and the upper quartile of Agriculture, R&C and Services, thereby deviating from Hypotheses 4 and 6. Table 12 below presents the means procedure distributions by firm size, income levels, listed and unlisted status, and sector.

Table 12: Means Procedure for Distribution of Access to Bank Credit/Assets and Corresponding Values

This table presents the means procedure for distribution of credit access as a share of firm-level assets (DEBT/ASSETS) for the sample firms. Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms according to the relevant panel by number, mean and standard deviation. Column (2) is the corresponding percentile distribution from 1st to 99th. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99. All figures are in thousands of dollars apart from number of firms (n) and Standard Deviation (St. Dev.).

Panel 1: All Firms								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
All Firms	27,927	0.253	0.494	0.000	0.075	0.201	0.351	1.048
o/w Small	2,514	0.359	1.380	0.000	0.055	0.183	0.375	2.510
o/w Medium	7,194	0.225	0.291	0.000	0.056	0.168	0.320	1.053
o/w Large	18,171	0.249	0.271	0.000	0.089	0.218	0.358	0.864
Panel 2: All Firms by Income Level								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
HI	13,040	0.245	0.334	0.000	0.065	0.198	0.350	1.043
o/w Small	480	0.411	1.234	0.000	0.041	0.192	0.442	4.953
o/w Medium	2,445	0.238	0.318	0.000	0.037	0.160	0.346	1.231
o/w Large	10,111	0.239	0.215	0.000	0.076	0.205	0.349	0.902
EM	14,887	0.261	0.599	0.000	0.081	0.204	0.351	1.051
o/w Small	2,034	0.347	1.412	0.000	0.058	0.180	0.363	2.311
o/w Medium	4,749	0.219	0.276	0.000	0.065	0.170	0.305	0.894
o/w Large	8,060	0.263	0.327	0.000	0.105	0.233	0.372	0.823
Panel 3: All Firms by Listed Status								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
Listed	26,247	0.248	0.481	0.000	0.073	0.198	0.345	0.995
o/w Small	2,374	0.349	1.340	0.000	0.054	0.178	0.366	2.669
o/w Medium	6,781	0.219	0.272	0.000	0.055	0.163	0.313	0.951
o/w Large	17,044	0.245	0.269	0.000	0.087	0.215	0.353	0.836
Unlisted	1,680	0.338	0.655	0.000	0.102	0.270	0.444	1.613
o/w Small	140	0.530	1.927	0.000	0.062	0.273	0.531	2.227
o/w Medium	413	0.331	0.498	0.000	0.077	0.256	0.443	2.314
o/w Large	1,127	0.317	0.292	0.000	0.119	0.276	0.441	1.278
Panel 4: All Firms by Sector								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
Agriculture	547	0.259	0.246	0.000	0.098	0.227	0.365	1.009
o/w Small	83	0.249	0.419	0.000	0.036	0.146	0.323	3.392
o/w Medium	187	0.245	0.205	0.000	0.082	0.206	0.349	1.043
o/w Large	275	0.273	0.197	0.000	0.135	0.263	0.385	0.807
R&C	2,215	0.276	0.573	0.000	0.082	0.208	0.363	1.267
o/w Small	253	0.384	0.065	0.000	0.065	0.165	0.358	3.211
o/w Medium	454	0.278	0.070	0.000	0.070	0.181	0.368	1.313
o/w Large	1,503	0.258	0.094	0.000	0.094	0.217	0.361	0.954
Manufacturing	13,558	0.246	0.539	0.000	0.076	0.197	0.338	1.053
o/w Small	1,119	0.405	0.068	0.000	0.068	0.199	0.398	2.714
o/w Medium	3,488	0.225	0.063	0.000	0.063	0.175	0.323	1.074
o/w Large	8,929	0.232	0.083	0.000	0.083	0.205	0.338	0.802
Services	11,591	0.258	0.426	0.000	0.071	0.205	0.366	1.011
o/w Small	1,057	0.314	0.044	0.000	0.044	0.163	0.353	1.897
o/w Medium	3,056	0.215	0.043	0.000	0.043	0.148	0.306	0.930
o/w Large	7,459	0.267	0.095	0.000	0.095	0.235	0.386	0.905

3. *SME Access to Long-term Bank Credit in Dollar Value*

As noted above, access to LTD is more problematic for SMEs than is total access. Only 19% of SMEs in the Level 2 sample can access LTD or are utilizing LTD, as compared with 34% for any form of bank credit. Table 13 below profiles SME (and large firm) access to long-term bank finance. The number of firms in the sample with access to (or at least utilizing) long-term bank credit was 22,085. This suggests that about 9,229 firms in the sample do not have access to long-term credit, a sizeable 29.5% share of total. By extension, the earlier-referenced Level 1 sample of 1.2 million firms would likely show virtually no access to LTD. Therefore, an easy assumption to make is that SMEs generally lack access to LTD.

Within the level 2 reporting sample, the number of firms with access to long-term credit by firm size is 1,808 for small, 4,808 for medium, and 15,469 for large. Therefore, SMEs account for 30% of firms in this sample with access to long-term credit, below the 38% of SMEs in the Level 2 sample.

Firm size measures of access to LTD as a share of firms with access to DEBT (total bank credit) shows the number of firms with access to LTD is positively correlated with firm size. Less than two thirds of SMEs with credit access or utilize LTD, whereas 86% of large-scale firms with credit have LTD. The specification of long-term bank credit in this case is consistent with the $LTD_{i,t}$ dependent variable described above.

Table 13 shows the data for long-term bank credit access indicate that average LTD for all firms is \$650 million, but the median is less than \$14 million. It is primarily with LTD that the skewness of credit distribution is apparent. This represents strong support for the hypotheses of positive correlation between firm size and credit allocation, particularly as it relates to LTD access. For instance, SME mean-to-median multipliers for total credit are about 1.5 times, whereas for LTD they are closer to 7-9 times. For large-scale firms, the multiplier exceeds 22 times, mainly due to the differential in HI Asia-Pacific where median large-scale debt is less than \$19 million.

By sector, multipliers vary by firm size. SMEs show the highest multipliers are in R&C and services, whereas large-scale firms have higher multipliers in manufacturing due to the lower median debt levels for large-scale firms in that sector.

Unlisted firms in the sample have higher multipliers than do listed firms, as well as higher levels of LTD dollar value in all categories than do listed firms. Their existing access to credit may partly explain why they are not listed.

Table 13: Firm Access to Long-term Credit based on Dollar Value

This table presents mean and median long-term credit (LTD) for sample firms in thousands of dollars. Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms by mean and median. Column (2) is small-scale firms by mean and median. Column (3) is medium-sized firms by mean and median. Column (4) is large-scale firms by mean and median. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All Firms	652,046	13,545	6,512	736	15,656	2,200	936,766	41,949
Panel 2: All Firms by Income Level								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
High Income	1,035,897	23,047	11,041	1,348	20,709	2,238	1,299,516	50,636
Emerging Markets	253,038	8,110	5,384	672	12,381	2,160	425,070	33,886
Panel 3: All Firms by Geographic Region								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Africa	152,352	10,341	7,253	1,177	14,864	2,485	230,701	26,192
Caribbean	27,299	3,458	2,827	389	4,718	2,219	51,835	14,431
Central Asia	152,317	5,170	8,637	101	20,538	2,479	312,604	38,903
EM-Asia/Pacific	238,541	7,519	3,643	655	9,852	1,820	400,632	30,943
EM-Europe	156,778	3,645	7,862	377	10,943	1,827	324,188	19,459
HI Asia-Pacific	402,628	11,540	5,830	862	9,626	1,908	492,119	18,992
HI Europe	1,125,393	44,917	17,963	1,599	30,746	3,571	1,496,561	106,174
Latin America	639,846	79,232	12,141	2,324	25,497	5,337	822,003	156,927
Middle East	362,318	18,320	8,136	1,247	25,227	3,145	535,105	45,645
South Asia	180,723	5,135	4,070	736	11,038	2,519	325,343	23,725
North America	2,096,493	108,843	3,754	1,209	28,857	1,246	2,590,204	309,748
Panel 4: All Firms by Listed Status								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Listed	639,245	13,007	5,921	723	14,509	2,116	919,524	39,559
Unlisted	841,787	27,959	16,622	1,004	32,453	4,606	1,188,730	103,438
Panel 5: All Firms by Sector								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Agriculture	135,739	7,582	1,564	362	14,173	2,769	235,528	30,868
R&C	751,718	32,340	7,422	592	34,864	3,991	1,031,187	89,656
Manufacturing	491,777	9,632	3,573	688	7,947	1,818	699,568	25,921
Services	834,064	19,243	9,688	875	20,521	2,445	1,212,635	70,906

The distribution of firm access to long-term bank credit indicates that firm size is positively correlated with credit access. This is consistent with Hypotheses 1, 3, 4 and 6. As with total credit, LTD indicators show the upper 1% with sizeable borrowings exceeding \$12 billion. This compares with median LTD of about \$13.5 million.

High-income markets show considerably higher medians than emerging markets, at about three times. These relationships increase as percentiles increase to the upper quartile. Unlisted firms are about twice the median to listed firms, which is considerably different from the overall debt access relationships. By sector, R&C shows the largest medians. The combination of observations suggests that unlisted, often

state-owned mining and oil & gas companies account for a significant share of LTD made available by the banks and capital markets.

The mean values, upper quartiles and 99th percentile show the impact and distortionary effect of outliers on means, all even more strongly for LTD than for general credit patterns. Means are significantly greater than medians in all categories. This supports fundamental premises of credit access literature that indicate a bias in favor of firm size. As noted above, this is even more strongly the case with LTD than short-term financing. Standard deviations also reflect the significant dispersion of values in the distribution, which are similar in shape but far greater in value than the means procedure for general credit access profiled above in Table 13. Table 14 below presents means procedure values and distributions for all reporting firms from the Level 2 sample by firm size, income level, listed status and sector.

Table 14: Means Procedure for Distribution of Access to Long-term Credit and Corresponding Credit Values

This table presents the means procedure for distribution of long-term credit (LTD) access for the sample firms. Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms according to the relevant panel by number, mean and standard deviation. Column (2) is the corresponding percentile distribution from 1st to 99th. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99. All figures are in thousands of dollars apart from number of firms (n) and Standard Deviation (St. Dev.).

Panel 1: All Firms								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
All Firms	23,860	652,046	3,718,338	0	1,407	13,545	124,564	12,431,000
o/w Small	1,956	6,512	48,513	0	109	736	2,921	85,386
o/w Medium	5,368	15,656	74,717	0	311	2,200	8,476	242,855
o/w Large	16,503	936,766	4,441,276	0	5,961	41,949	306,728	16,865,356
Panel 2: All Firms by Income Level								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
HI	12,161	1,035,897	4,954,223	0	2,250	23,047	258,200	19,272,811
o/w Small	390	11,041	57,491	0	122	1,348	4,894	110,761
o/w Medium	2,111	20,709	107,918	0	218	2,238	9,116	301,916
o/w Large	9,657	1,299,516	5,528,919	0	5,909	50,636	474,726	22,511,000
EM	11,699	253,038	1,540,531	0	977	8,110	63,030	4,626,643
o/w Small	1,566	5,384	45,957	0	106	672	2,478	74,608
o/w Medium	3,257	12,381	40,343	0	372	2,160	8,034	181,355
o/w Large	6,846	425,070	1,995,754	0	6,016	33,886	188,169	6,949,248
Panel 3: All Firms by Listed Status								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
Listed	22,352	639,245	3,735,444	0	1,386	13,007	116,513	12,296,500
o/w Small	1,848	5,921	43,185	0	108	723	2,827	85,386
o/w Medium	5,025	14,509	69,933	0	303	2,116	7,924	221,055
o/w Large	15,446	919,524	4,465,030	0	5,873	39,559	290,340	16,865,356
Unlisted	1,508	841,787	3,450,464	0	2,005	27,958	306,602	12,699,000
o/w Small	108	16,622	103,435	0	113	1,004	5,840	81,508
o/w Medium	343	32,453	124,351	0	425	4,606	20,007	458,016
o/w Large	1,057	1,188,730	4,072,034	0	7,511	103,438	689,847	17,066,000
Panel 4: All Firms by Sector								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1st	<25th	Median	>75th	99th
Agriculture	461	135,739	769,186	0	936	7,582	42,189	2,811,500
o/w Small	66	1,564	3,329	0	93	362	1,338	17,330
o/w Medium	137	14,173	53,297	0	658	2,769	8,798	327,027
o/w Large	257	235,528	1,019,306	0	6,769	30,868	140,804	5,183,098
R&C	1,940	751,718	3,623,365	0	2,842	32,340	253,254	13,477,000
o/w Small	187	7,422	27,722	0	82	592	4,042	142,054
o/w Medium	348	34,864	205,108	0	545	3,991	18,964	360,927
o/w Large	1,401	1,031,187	4,229,827	0	12,770	89,656	503,112	15,148,000
Manufacturing	11,257	491,777	3,466,146	0	1,230	9,632	70,610	9,466,072
o/w Small	858	3,573	14,182	0	95	688	2,184	55,905
o/w Medium	2,504	7,947	33,382	0	282	1,818	6,103	104,077
o/w Large	7,880	699,568	4,125,433	0	4,597	25,921	158,533	12,863,687
Services	10,190	834,064	4,062,297	0	1,529	19,243	212,774	16,046,000
o/w Small	844	9,688	71,148	0	124	875	4,512	95,970
o/w Medium	2,372	20,521	64,907	0	307	2,445	11,788	301,916
o/w Large	6,961	1,212,635	4,868,645	0	8,037	70,906	519,563	19,847,000

4. *Access to LTD by Firm as a Share of Total Assets*

Table 15 shows that, as a share of total assets, mean-to-median LTD ratios are highest for small-scale firms (2.3 times), slightly lower for medium-sized firms (2.1 times), and lower for large-scale firms (1.4 times). While the specific multipliers differ, these patterns by firm size hold by income level, region, listed status and sector. This means that average LTD levels as a share of assets are highest for small-scale firms and lowest for large-scale firms, indicating that there is an inverse relationship between firm size and LTD access on a relative basis. As with total credit access in relation to total assets, this is inconsistent with the hypothesis. Therefore, additional hypothesis testing is required to confirm or refute Hypothesis 1 as it applies to term credit, and Hypotheses 3, 4 and 6 by extension.

Table 15: Firm Access to Long-term Credit as a Share of Firm-Level Assets

This table presents mean and median long-term credit for sample firms as a share of firm-level assets (LTD/ASSETS). Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms by mean and median. Column (2) is small-scale firms by mean and median. Column (3) is medium-sized firms by mean and median. Column (4) is large-scale firms by mean and median. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All Firms	0.158	0.099	0.174	0.075	0.129	0.062	0.165	0.115
Panel 2: All Firms by Income Level								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
High Income	0.173	0.113	0.273	0.100	0.145	0.071	0.174	0.123
Emerging Markets	0.143	0.085	0.149	0.071	0.118	0.059	0.151	0.105
Panel 3: All Firms by Geographic Region								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Africa	0.138	0.089	0.181	0.088	0.134	0.073	0.132	0.096
Caribbean	0.119	0.076	0.150	0.069	0.087	0.064	0.113	0.108
Central Asia	0.221	0.086	0.222	0.019	0.232	0.087	0.212	0.162
EM-Asia/Pacific	0.120	0.068	0.119	0.049	0.100	0.049	0.131	0.086
EM-Europe	0.143	0.081	0.113	0.058	0.150	0.064	0.153	0.105
HI Asia-Pacific	0.109	0.067	0.137	0.078	0.108	0.053	0.108	0.070
HI Europe	0.199	0.155	0.269	0.103	0.190	0.119	0.197	0.166
Latin America	0.225	0.198	0.269	0.185	0.176	0.127	0.234	0.215
Middle East	0.162	0.105	0.148	0.103	0.145	0.073	0.170	0.119
South Asia	0.160	0.092	0.181	0.088	0.108	0.076	0.150	0.097
North America	0.260	0.204	0.385	0.104	0.156	0.044	0.274	0.240
Panel 4: All Firms by Listed Status								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Listed	0.153	0.096	0.172	0.074	0.125	0.060	0.159	0.110
Unlisted	0.227	0.165	0.211	0.102	0.182	0.110	0.244	0.189
Panel 5: All Firms by Sector								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Agriculture	0.132	0.094	0.114	0.047	0.128	0.082	0.139	0.114
R&C	0.179	0.115	0.149	0.055	0.180	0.076	0.182	0.134
Manufacturing	0.130	0.079	0.179	0.068	0.107	0.054	0.131	0.089
Services	0.185	0.128	0.178	0.089	0.143	0.070	0.200	0.152

The distribution of firm access to LTD as a share of total assets presents a different picture. On the one hand, small-scale firms typically show higher averages on a vertical basis in total, although this is not the case in emerging markets, for unlisted firms, or in Agriculture, R&C or Services. Therefore, the pattern is dispersed and varied by category.

A comparison of distributions by percentile also shows differing patterns. For instance, large-scale firms have the highest share of LTD to total assets except for the bottom and top 1%. At 1%, all firm sizes show 0%. However, at 99%, small-scale firms have the highest mean ratios. Therefore, the results for small-scale firm LTD averages are largely influenced by the upper 1% of small-scale firms. This is not consistent with Hypothesis 1. There are also patterns that show some deviation from the norm, such as the upper

quartile of high-income markets and the upper quartile of Manufacturing. Table 16 below presents the means procedure distributions by firm size, income levels, listed and unlisted status, and sector.

Table 16: Means Procedure for Distribution of Access to Long-term Credit as a Share of Firm-Level Assets

This table presents the means procedure for distribution of long-term credit access for the sample firms as a share of firm-level total assets (LTD/ASSETS). Panel (1) presents all firms in total and by firm size. Panel (2) presents all firms in total and by firm size by income level. Panel (3) presents all firms in total and by firm size by geographic region. Panel (4) presents all firms in total and by firm size by listed status. Panel (5) presents all firms in total and by firm size by sector. Column (1) is all firms according to the relevant panel by number, mean and standard deviation. Column (2) is the corresponding percentile distribution from 1st to 99th. HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99. All figures are in thousands of dollars apart from number of firms (n) and Standard Deviation (St. Dev.).

Panel 1: All Firms								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1 st	<25 th	Median	>75 th	99 th
All Firms	23,860	0.158	0.231	0.000	0.021	0.099	0.228	0.796
o/w Small	1,956	0.174	0.375	0.000	0.014	0.075	0.215	1.302
o/w Medium	5,368	0.129	0.230	0.000	0.010	0.062	0.176	0.773
o/w Large	16,503	0.165	0.204	0.000	0.028	0.115	0.244	0.751
Panel 2: All Firms by Income Level								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1 st	<25 th	Median	>75 th	99 th
HI	12,161	0.173	0.227	0.000	0.021	0.113	0.254	0.869
o/w Small	390	0.273	0.645	0.000	0.010	0.100	0.317	3.995
o/w Medium	2,111	0.145	0.208	0.000	0.007	0.071	0.201	0.874
o/w Large	9,657	0.174	0.196	0.000	0.027	0.123	0.261	0.840
EM	11,699	0.143	0.235	0.000	0.020	0.085	0.203	0.694
o/w Small	1,566	0.149	0.264	0.000	0.015	0.071	0.192	1.103
o/w Medium	3,257	0.118	0.242	0.000	0.012	0.059	0.165	0.645
o/w Large	6,846	0.151	0.213	0.000	0.030	0.105	0.220	0.647
Panel 3: All Firms by Listed Status								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1 st	<25 th	Median	>75 th	99 th
Listed	22,352	0.153	0.228	0.000	0.021	0.096	0.220	0.761
o/w Small	1,848	0.172	0.379	0.000	0.014	0.074	0.210	1.274
o/w Medium	5,025	0.125	0.226	0.000	0.010	0.060	0.172	0.770
o/w Large	15,446	0.159	0.197	0.000	0.028	0.110	0.236	0.719
Unlisted	1,508	0.227	0.270	0.000	0.030	0.165	0.334	1.013
o/w Small	108	0.211	0.294	0.000	0.016	0.102	0.300	1.517
o/w Medium	343	0.182	0.267	0.000	0.016	0.110	0.249	0.867
o/w Large	1,057	0.244	0.267	0.000	0.047	0.189	0.353	0.997
Panel 4: All Firms by Sector								
	(1) Total			(2) Percentile				
	n	Mean	St. Dev.	1 st	<25 th	Median	>75 th	99 th
Agriculture	461	0.132	0.141	0.000	0.025	0.094	0.189	0.623
o/w Small	66	0.114	0.176	0.000	0.010	0.047	0.150	1.008
o/w Medium	137	0.128	0.152	0.000	0.021	0.082	0.181	0.610
o/w Large	257	0.139	0.125	0.000	0.039	0.114	0.206	0.593
R&C	1,940	0.179	0.260	0.000	0.026	0.115	0.247	0.945
o/w Small	187	0.149	0.253	0.000	0.009	0.055	0.169	1.517
o/w Medium	348	0.180	0.431	0.000	0.016	0.076	0.213	1.224
o/w Large	1,401	0.182	0.196	0.000	0.034	0.134	0.262	0.874
Manufacturing	11,257	0.130	0.196	0.000	0.018	0.079	0.185	0.700
o/w Small	858	0.179	0.445	0.000	0.014	0.068	0.199	1.347
o/w Medium	2,504	0.107	0.155	0.000	0.009	0.054	0.150	0.681
o/w Large	7,880	0.131	0.148	0.000	0.022	0.089	0.192	0.642
Services	10,190	0.185	0.259	0.000	0.024	0.128	0.280	0.851
o/w Small	844	0.178	0.329	0.000	0.016	0.089	0.241	1.186
o/w Medium	2,372	0.143	0.249	0.000	0.010	0.070	0.210	0.783
o/w Large	6,961	0.200	0.250	0.000	0.038	0.152	0.300	0.840

5. *SMEs with No Access to Bank Credit*

As noted above and presented below in Table 17, a large number (4,535) of firms in the sample lack access or are not utilizing bank credit in some form. This is 14.5% of the total Level 2 sample of firms. By firm size, the number of firms without access to bank credit is 865 for small, 1,708 for medium, and 1,962 for large. However, the share of SMEs without credit is significant, particularly when accounting for the share of large-scale firms in the Level 2 sample at about 62%. Therefore, these results support the argument that SMEs face greater challenges accessing credit and that they account for most firms in the Level 2 sample without credit. The share of the Level 1 sample of nearly 1.2 million firms where SMEs account for about 85% of total would very likely reinforce the point that most SMEs lack credit, above all LTD.

Table 17: Overview of Frequency Distribution of SMEs Without Access to Bank Credit

This table presents summary frequency distribution data for sample firms that do not or cannot access credit (DEBT), including long-term credit (LTD). Column (1) presents the total number of firms by firm size that reported having no bank (or corporate bond) credit. Column (2) presents the share of firms by firm size that reported no credit. Column (3) presents the total number of firms by firm size that reported having no long-term credit. Column (4) presents the share of firms by firm size that reported having no long-term credit.

	(1) Total w/o Credit	(2) % of Total	(3) Total w/o LTD	(4) % of LTD
>\$50 million = Large	1,962	43%	3,916	43%
\$10-\$50 million = Medium	1,708	38%	3,659	40%
\$2-\$10 million = Small	865	19%	1,474	16%
Total	4,535	100%	9,049	100%
o/w SMEs	2,573	57%	5,133	57%

The above patterns are apparent as well in relation to access to long-term financing. The sample shows that 9,049 firms do not have access or utilize LTD among reporting firms. This is twice the number of firms that access lines of credit.

Table 18 below provides a more specific profile of where access to LTD is most problematic among all reporting firms. The challenges are most severe in emerging markets and are prevalent in Manufacturing and Services where most firms operate. Listed companies also face challenges, which is instructive as increased disclosure and any benefits from market listings do not automatically equate with access to LTD.

Table 18: Number of Firms without Access to Long-term Bank Credit

This table presents data on sample firms that do not have long-term credit (LTD). Panel (1) presents all firms in total and by firm size that do and do not have credit, including long-term credit. The purpose of the panel is to provide context for the sample as a whole. Panel (2) presents all firms in total and by firm size by income level that do not have long-term credit. Percentages are based on the number of firms without LTD as a share of total firms with and without credit. Panel (3) presents all firms in total and by firm size by geographic region that do not have long-term credit. Percentages are based on the number of firms without LTD as a share of total firms with and without credit. Panel (4) presents all firms in total and by firm size by listed status that do not have long-term credit. Percentages are based on the number of firms without LTD as a share of total firms with and without credit. Panel (5) presents all firms in total and by firm size by sector that do not have long-term credit. Percentages are based on the number of firms without LTD as a share of total firms with and without credit. Column (1) is all firms according to the relevant panel by number and percent of total. Column (2) is small-scale firm data according to the relevant panel by number and percent of total. Column (3) is medium-sized firm data according to the relevant panel by number and percent of total. Column (4) is large-scale firm data according to the relevant panel by number and percent of total. Column (1) presents sample data for all firms, including “Catch All” firms that have characteristics spanning multiple categories, resulting in total observations that exceed those of the combined Columns (2)-(4). HI = High-income markets; EM = Emerging markets; Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms with and without Credit including Long-term Credit (LTD)								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	n	%	n	%	n	%	n	%
w/ and w/o Credit	31,414	100%	3,282	10%	8,467	27%	19,385	62%
w/o Credit	4,767	15%	865	3%	1,708	5%	1,962	6%
w/o LTD	9,297	30%	1,474	5%	3,659	12%	3,916	12%
Panel 2: Firms without LTD by Income Level								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	n	%	n	%	n	%	n	%
High Income	3,096	10%	356	1%	1,016	3%	1,697	5%
Emerging Markets	6,201	20%	1,118	4%	2,643	8%	2,219	7%
Panel 3: Firms without LTD by Geographic Region								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	n	%	n	%	n	%	n	%
Africa	238	1%	62	0%	83	0%	92	0%
Caribbean	22	0%	4	0%	6	0%	12	0%
Central Asia	65	0%	28	0%	23	0%	13	0%
EM-Asia/Pacific	3,913	12%	412	1%	2,027	6%	1,326	4%
EM-Europe	749	2%	249	1%	222	1%	262	1%
HI Asia-Pacific	1,568	5%	90	0%	524	2%	949	3%
HI Europe	784	2%	148	0%	273	1%	349	1%
Latin America	191	1%	26	0%	59	0%	90	0%
Middle East	469	1%	106	0%	159	1%	194	1%
South Asia	554	2%	231	1%	64	0%	230	1%
North America	744	2%	118	0%	219	1%	399	1%
Panel 4: Firms without LTD by Listed Status								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	n	%	n	%	n	%	n	%
Listed	8,703	28%	1,387	4%	3,462	11%	3,642	12%
Unlisted	594	2%	87	0%	197	1%	274	1%
Panel 5: Firms without LTD by Sector								
	(1) All Firms		(2) Small		(3) Medium		(4) Large	
	n	%	n	%	n	%	n	%
Agriculture	161	1%	41	0%	78	0%	41	0%
R&C	668	2%	171	1%	210	1%	273	1%
Manufacturing	4,678	15%	600	2%	1,781	6%	2,153	7%
Services	3,782	12%	661	2%	1,588	5%	1,448	5%

C. GLM Procedure and ANOVA

The GLM procedure is used to conduct ANOVA for the Level 2 sample as it is unbalanced, as reflected in the representation of large-scale firms compared to SMEs. The GLM procedure determines F values for the three Revenue Quantiles as well as for interactive categories being evaluated (i.e., income, region, listed status, sector). High F values and statistical significance help to determine the suitability of models to be used in hypothesis testing.

The full equations are presented below, with individual subsections discussed based on the four potential dependent variables used for the analysis.

$$DEBT_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \epsilon_{i,x} \quad (1)$$

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \epsilon_{i,x} \quad (2)$$

$$LTD_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \epsilon_{i,x} \quad (3)$$

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \epsilon_{i,x} \quad (4)$$

1. *DEBT as Dependent Variable*

ANOVA results show an F-value that is comparatively high at 159.95, suggesting the model would have some usefulness in explaining differences in firm size effect in relation to the dependent variable. However, results are less compelling when showing the effects of categories of interest. The interaction of REVQUANT and INCOME shows an F-value of 119.39, but INCOME itself is not statistically significant. Other categories and relationships show lower F-values and several examples where statistical significance does not exist. Only nine of 16 results are statistically significant. Therefore, this model can be rejected apart from the general interaction between firm size and DEBT.

Table 19: ANOVA Results for Level 2 Sample with DEBT as the Dependent Variable

This table presents ANOVA results based on the GLM procedure for the full Level 2 sample. The operative equation (1) is $DEBT_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT. Panel (1) presents general results. Panel (2) presents results by income level. Panel (3) presents results by region. Panel (4) presents results by listed status. Panel (5) presents results by sector. Column (1) presents total number of observations. Column (2) presents corrected total for REVQUANT and Degrees of Freedom (DF) in the model for interactive terms. Column (3) presents F-values. Column (4) provides p-values as indicators of statistical significance. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Dependent Variable: DEBT				
Panel 1: REVQUANT				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT	30,526	30,525	159.95	<.0001***
Panel 2: REVQUANT and INCOME LEVEL				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT INCOME	30,526	30,525	119.39	<.0001***
REVQUANT		3	128.26	<.0001***
INCOME		1	0.43	.5098
REVQUANT*INCOME		3	38.79	<.0001***
Panel 3: REVQUANT and REGION				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT REGION	30,526	30,525	24.48	<.0001***
REVQUANT		3	13.90	<.0001***
REGION		10	1.41	.1697
REVQUANT*REGION		27	5.65	<.0001***
Panel 4: REVQUANT and LISTED STATUS				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT LISTED	30,526	30,525	80.70	<.0001***
REVQUANT		3	27.75	<.0001***
LISTED		1	0.43	.5113
REVQUANT*LISTED		2	0.73	.4807
Panel 5: REVQUANT and SECTOR				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT SECTOR	30,526	30,525	27.40	<.0001***
REVQUANT		3	1.30	.2739
SECTOR		4	0.01	.9997
REVQUANT*SECTOR		11	0.58	.8474

2. DEBT/ASSETS as Dependent Variable

ANOVA results show an F-value of 53.02, suggesting the model would have limited usefulness in explaining differences in firm size effect in relation to the dependent variable. Results are even less compelling when showing the effects of categories of interest. However, the model shows most results to be statistically significant. This was true in 13 of 16 cases. Therefore, particularly when compared to DEBT with only nine of 16 results being statistically significant, DEBT/ASSET is considered to be a better dependent variable for model purposes to test for the general interaction between firm size and DEBT/ASSETS.

Table 20: ANOVA Results for Level 2 Sample with DEBT/ASSETS as the Dependent Variable

This table presents ANOVA results based on the GLM procedure for the full Level 2 sample. The operative equation (2) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Panel (1) presents general results. Panel (2) presents results by income level. Panel (3) presents results by region. Panel (4) presents results by listed status. Panel (5) presents results by sector. Column (1) presents total number of observations. Column (2) presents corrected total for REVQUANT and Degrees of Freedom (DF) in the model for interactive terms. Column (3) presents F-values. Column (4) provides p-values as indicators of statistical significance. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Dependent Variable: DEBT/ASSETS				
Panel 1: REVQUANT				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT	27,927	27,926	53.02	<.0001***
Panel 2: REVQUANT and INCOME LEVEL				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT INCOME	27,927	27,926	25.62	<.0001***
REVQUANT		3	40.59	<.0001***
INCOME		1	0.26	.6107
REVQUANT*INCOME		3	6.13	.0004***
Panel 3: REVQUANT and REGION				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT REGION	27,927	27,926	10.41	<.0001***
REVQUANT		3	6.13	.0004***
REGION		10	1.48	.1383
REVQUANT*REGION		26	3.65	<.0001***
Panel 4: REVQUANT and LISTED STATUS				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT LISTED	27,927	27,926	36.74	<.0001***
REVQUANT		3	22.59	<.0001***
LISTED		1	49.85	<.0001***
REVQUANT*LISTED		2	3.36	.0348**
Panel 5: REVQUANT and SECTOR				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT SECTOR	27,927	27,926	12.39	<.0001***
REVQUANT		3	0.96	.4094
SECTOR		4	2.93	.0195**
REVQUANT*SECTOR		11	5.12	<.0001***

3. LTD as Dependent Variable

ANOVA results show an F-value that is comparatively high at 105.99, suggesting the model would have some usefulness in explaining differences in firm size effect in relation to the dependent variable. However, results are less compelling when showing the effects of categories of interest. The interaction of REVQUANT and INCOME shows an F-value of 78.22, but INCOME itself is not statistically significant. Other categories and relationships show lower F-values and several examples where statistical significance does not exist. In total, only 11 of 16 results are statistically significant. Therefore, this model can be rejected apart from the general results in relation to LTD as the dependent variable.

Table 21: ANOVA Results for Level 2 Sample with Long-term Debt as the Dependent Variable

This table presents ANOVA results based on the GLM procedure for the full Level 2 sample. The operative equation (3) is $LTD_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \epsilon_{i,x}$. The dependent variable is LTD. Panel (1) presents general results. Panel (2) presents results by income level. Panel (3) presents results by region. Panel (4) presents results by listed status. Panel (5) presents results by sector. Column (1) presents total number of observations. Column (2) presents corrected total for REVQUANT and Degrees of Freedom (DF) in the model for interactive terms. Column (3) presents F-values. Column (4) provides p-values as indicators of statistical significance. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Dependent Variable: LONG-TERM DEBT				
Panel 1: REVQUANT				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT	23,860	23,859	105.99	<.0001***
Panel 2: REVQUANT and INCOME LEVEL				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT INCOME	23,860	23,859	78.22	<.0001***
REVQUANT		3	80.81	<.0001***
INCOME		1	0.15	.6985
REVQUANT*INCOME		3	21.14	<.0001***
Panel 3: REVQUANT and REGION				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT REGION	23,860	23,859	30.34	<.0001***
REVQUANT		3	9.40	<.0001***
REGION		10	3.54	.0001***
REVQUANT*REGION		24	7.46	<.0001***
Panel 4: REVQUANT and LISTED STATUS				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT LISTED	23,860	23,859	53.88	<.0001***
REVQUANT		3	31.02	<.0001***
LISTED		1	0.47	.4944
REVQUANT*LISTED		2	0.70	.4989
Panel 5: REVQUANT and SECTOR				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT SECTOR	23,860	23,859	22.27	<.0001***
REVQUANT		3	0.61	.6103
SECTOR		4	0.06	.9938
REVQUANT*SECTOR		11	2.33	.0074***

4. LTD/ASSETS as Dependent Variable

ANOVA results show an F-value that is fairly low at 64.12, suggesting the model would have limited usefulness in explaining differences in firm size effect in relation to the dependent variable. However, unlike all the results for the other three dependent variables, this model shows much higher statistical significance. Fifteen of 16 results are statistically significant. Only INCOME as a variable lacks statistical significance. Therefore, despite relatively low F-values, the model is otherwise sound for testing independent variables and how they interact to explain LTD/ASSETS. Therefore, this model can be accepted and is a better model than with LTD as the dependent variable.

Table 22: ANOVA Results for Level 2 Sample with LTD/ASSETS as the Dependent Variable

This table presents ANOVA results based on the GLM procedure for the full Level 2 sample. The operative equation (4) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 REVQUANT + \beta_2 INCOME_{i,x} + \beta_3 REGION_{i,x} + \beta_4 LISTED_{i,x} + \beta_5 SECTOR_{i,x} + \varepsilon_{i,x}$. The dependent variable is LTD/ASSETS. Panel (1) presents general results. Panel (2) presents results by income level. Panel (3) presents results by region. Panel (4) presents results by listed status. Panel (5) presents results by sector. Column (1) presents total number of observations. Column (2) presents corrected total for REVQUANT and Degrees of Freedom (DF) in the model for interactive terms. Column (3) presents F-values. Column (4) provides p-values as indicators of statistical significance. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Dependent Variable: LTD/ASSETS				
Panel 1: REVQUANT				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT	23,860	23,859	64.12	<.0001***
Panel 2: REVQUANT and INCOME LEVEL				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT INCOME	23,860	23,859	48.87	<.0001***
REVQUANT		3	55.05	<.0001***
INCOME		1	0.79	.3745
REVQUANT*INCOME		3	18.44	<.0001***
Panel 3: REVQUANT and REGION				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT REGION	23,860	23,859	44.08	<.0001***
REVQUANT		3	12.94	<.0001***
REGION		10	36.11	<.0001***
REVQUANT*REGION		24	7.18	<.0001***
Panel 4: REVQUANT and LISTED STATUS				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT LISTED	23,860	23,859	58.28	<.0001***
REVQUANT		3	42.56	<.0001***
LISTED		1	44.17	<.0001***
REVQUANT*LISTED		2	3.09	.0456**
Panel 5: REVQUANT and SECTOR				
	(1) n	(2) DF or Corrected Total	(3) F-value	(4) Pr > F
REVQUANT SECTOR	23,860	23,859	34.94	<.0001***
REVQUANT		3	5.41	.0010***
SECTOR		4	2.74	.0271**
REVQUANT*SECTOR		11	8.65	<.0001***

D. Linear Regression Results

The baseline linear regression tests compare coefficients (standardized parameter estimates) of credit access by firm size based on the revenue quantile definitions used in this research in addition to two associated dummy variables (“SMALL” and “MEDIUM”) to test for firm size effect. This is carried out in nine steps, starting with the dependent variable on the left-hand side of the equation and all independent variables and dummy variables for all categories of interest (e.g., income level, region, listed status, sector) on the right-hand side of the equation. Therefore, the test starts by running the aggregated model on the full sample only, allowing the coefficients to vary between small, medium, and large firms by using category dummies and interactive terms with the dummies. The results identify where test results are likely to have the greatest effectiveness in explaining the effects of the independent variables on dependent variables. The subsequent steps ultimately continue these tests to provide explanations of the effects of the independent variables on dependent variables based on categories of interest. The operative equations for each of the nine steps are presented in Table 23 below.

Table 23: Overview of All Baseline Regression Equations

This table provides all the equations used in the baseline regressions. Panel (1) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all independent variables and dummy variables on the right-hand side. Panel (2) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all independent variables and firm size dummy variables on the right-hand side. Panel (2) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all independent variables and firm size dummy variables on the right-hand side. Panel (3) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all legal and institutional independent variables and dummy variables on the right-hand side. Panel (4) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and dummy variables on the right-hand side. Panel (5) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and firm size dummy variables on the right-hand side. Panel (6) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and firm size dummy variables and income dummy on the right-hand side. Panel (7) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and firm size dummy variables and regional dummies on the right-hand side. Panel (8) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and firm size dummy variables and listed status dummy on the right-hand side. Panel (9) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and firm size dummy variables and sector dummies on the right-hand side. Step number corresponds to the step number for the testing. Equation number applies to econometric specifications for each test.

Step No.	Equation	Equation No.
1	Panel 1: All Independent Variables and All Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTEBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \varepsilon_{i,x}$	(5)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTEBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \varepsilon_{i,x}$	(6)
2	Panel 2: All Independent Variables and Firm Size Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTEBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \varepsilon_{i,x}$	(7)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTEBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \varepsilon_{i,x}$	(8)
3	Panel 3: All Legal and Institutional Independent Variables and All Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \varepsilon_{i,x}$	(9)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \varepsilon_{i,x}$	(10)
4	Panel 4: All Financial Independent Variables and All Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \beta_{10} REGION_{i,x1} + \beta_{11} REGION_{i,x2} + \beta_{12} REGION_{i,x3} + \beta_{13} REGION_{i,x4} + \beta_{14} REGION_{i,x5} + \beta_{15} REGION_{i,x6} + \beta_{16} REGION_{i,x7} + \beta_{17} REGION_{i,x8} + \beta_{18} REGION_{i,x9} + \beta_{19} REGION_{i,x10} + \beta_{20} LISTED_{i,x} + \beta_{21} SECTOR_{i,x1} + \beta_{22} SECTOR_{i,x2} + \beta_{23} SECTOR_{i,x3} + \varepsilon_{i,x}$	(11)

	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \beta_{10}REGION_{i,x1} + \beta_{11}REGION_{i,x2} + \beta_{12}REGION_{i,x3} + \beta_{13}REGION_{i,x4} + \beta_{14}REGION_{i,x5} + \beta_{15}REGION_{i,x6} + \beta_{16}REGION_{i,x7} + \beta_{17}REGION_{i,x8} + \beta_{18}REGION_{i,x9} + \beta_{19}REGION_{i,x10} + \beta_{20}LISTED_{i,x} + \beta_{21}SECTOR_{i,x1} + \beta_{22}SECTOR_{i,x2} + \beta_{23}SECTOR_{i,x3} + \varepsilon_{i,x}$	(12)
5	Panel 5: All Financial Independent Variables and Firm Size Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \varepsilon_{i,x}$	(13)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \varepsilon_{i,x}$	(14)
6	Panel 6: All Financial Independent Variables and Firm Size Dummies and Income Dummy	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x}$	(15)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x}$	(16)
7	Panel 7: All Financial Independent Variables and Firm Size Dummies and Region Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9REGION_{i,x1} + \beta_{10}REGION_{i,x2} + \beta_{11}REGION_{i,x3} + \beta_{12}REGION_{i,x4} + \beta_{13}REGION_{i,x5} + \beta_{14}REGION_{i,x6} + \beta_{15}REGION_{i,x7} + \beta_{16}REGION_{i,x8} + \beta_{17}REGION_{i,x9} + \beta_{18}REGION_{i,x10} + \varepsilon_{i,x}$	(17)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9REGION_{i,x1} + \beta_{10}REGION_{i,x2} + \beta_{11}REGION_{i,x3} + \beta_{12}REGION_{i,x4} + \beta_{13}REGION_{i,x5} + \beta_{14}REGION_{i,x6} + \beta_{15}REGION_{i,x7} + \beta_{16}REGION_{i,x8} + \beta_{17}REGION_{i,x9} + \beta_{18}REGION_{i,x10} + \varepsilon_{i,x}$	(18)
8	Panel 8: All Financial Independent Variables and Firm Size Dummies and Listed Dummy	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9LISTED_{i,x} + \varepsilon_{i,x}$	(19)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9LISTED_{i,x} + \varepsilon_{i,x}$	(20)
9	Panel 9: All Financial Independent Variables and Firm Size Dummies and Sector Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \varepsilon_{i,x}$	(21)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \varepsilon_{i,x}$	(22)

Because variables cannot be compared across multiple regressions if data subsets have different variances, each test is run as a singular equation to determine whether size differentials are significant. F-values are used to compare differences between categorical variables or groups as opposed to the variation within those groups. Chi tests are presented as part of the White Test for heteroscedasticity to examine the differences between categorical variables in the same population (see results in Annex 4). Along with collinearity diagnostics and statistical significance tests, these results are used to determine whether the variances across firm size samples are the same, and then to determine whether the difference across size (or any of the other variables) is significant.

Each of the subsections below present data for the relevant variables. Firm size dummy results show results for small and medium-sized firms, with large-scale firms captured in the baseline results. Income level dummies present emerging markets results, with high-income markets captured in the baseline results. Regional dummies present results for all but North America, which are captured in the baseline results. Listed status dummies present results for quoted or listed firms, with unlisted firms captured in

the baseline results. Sector dummies present results for Agriculture, R&C and Manufacturing, with Services captured in the baseline results.

1. *Step 1: Full Model Results—All Independent Variables and Dummies*

a) *DEBT/ASSETS as Dependent Variable*

The Step 1 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all independent variables and dummy variables, and is represented by the following equation:

$$\begin{aligned} DEBT_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \\ & \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \\ & \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \\ & \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \\ & \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \\ & \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \\ & \beta_{30} SECTOR_{i,x3} + \epsilon_{i,x} \end{aligned} \quad (5)$$

The results are based on 21,500 observations. The F value is high at 748.76, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4849.

However, several of the variables (income, region) reflect biased estimates. Moreover, several of the variables show high VIV and low Tolerance estimates, while other variables are not statistically significant. Collinearity issues are particularly problematic for emerging markets, all four results for Asia-Pacific and Europe, and three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV). Meanwhile, there are no results for South Asia, and results for the Caribbean and EM Europe are not statistically significant. At the sector level, only Manufacturing showed statistical significance, and this was weak.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the MEDIUM dummy is not statistically significant. However, the model results are rejected due to problems of collinearity and other weaknesses described above.

Table 24: Full Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the full model collinearity results for variable selection. The operative equation (5) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the full model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income level dummy, regional dummy, listed status dummy and sector dummy, as well as by legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Full Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	748.76	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.17863	0.84844	0.01310	2.46	0.0137**
“MEDIUM”	1.14196	0.87569	0.00212	0.40	0.6859
EMERGING	23.29453	0.04293	-0.12032	-5.09	<.0001***
AFRICA	1.56487	0.63903	-0.01869	-3.05	0.0023***
CARIBBEAN	1.08645	0.92043	-0.00661	-1.29	0.1957
CENTRAL_ASIA	1.15648	0.86470	0.02144	4.07	<.0001***
EM_ASIA-PACIFIC	12.24729	0.08165	0.07737	4.51	<.0001***
EM_EUROPE	5.08070	0.19682	-0.00187	-0.17	0.8653
HI_ASIA-PACIFIC	11.55864	0.08652	-0.03529	-2.12	0.0341**
HI_EUROPE	7.15711	0.13972	-0.04353	-3.32	0.0009***
LATIN_AMERICA	2.21194	0.45209	0.01600	2.20	0.0281**
MIDDLE_EAST	2.75329	0.36320	0.02526	3.11	0.0019***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06516	0.93882	-0.03308	-6.54	<.0001***
AGRICULTURE	1.04464	0.95726	0.00129	0.26	0.7959
RESOURCES_CONSTRUCTION	1.14293	0.87494	-0.00067491	-0.13	0.8974
MANUFACTURING	1.19454	0.83714	0.00988	1.85	0.0649*
CREDINFO	1.70203	0.58753	-0.01012	-1.58	0.1134
MINSH	1.93400	0.51706	0.03225	4.74	<.0001***
PROPERTY	3.71092	0.26947	-0.03497	-3.71	0.0002***
LRINDEX	1.54706	0.64639	-0.01182	-1.94	0.0524*
CONTRENF	4.04366	0.24730	-0.03822	-3.88	0.0001***
INSOLV	3.72719	0.26830	0.01072	1.13	0.2567
EBIT_TOAS	1.34261	0.74482	0.16772	29.55	<.0001***
NWC_TOAS	1.38054	0.72435	-0.73743	-128.15	<.0001***
MOVEABLE_TOAS	1.10040	0.90876	0.01788	3.48	0.0005***
DEBT_EBITDA	1.00093	0.99907	0.04722	9.64	<.0001***
IC	1.0721	0.93269	-0.08532	-16.82	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 1 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all independent variables and dummy variables, and is represented by following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \quad (6)$$

$$\begin{aligned} & \beta_{12}DEBTBITDA_{i,x} + \beta_{13}IC_{i,x} + \beta_{14}SMALL_{i,x} + \beta_{15}MEDIUM_{i,x} + \beta_{16}INCOME_{i,x} + \beta_{17}REGION_{i,x1} + \\ & \beta_{18}REGION_{i,x2} + \beta_{19}REGION_{i,x3} + \beta_{20}REGION_{i,x4} + \beta_{21}REGION_{i,x5} + \beta_{22}REGION_{i,x6} + \beta_{23}REGION_{i,x7} + \\ & \beta_{24}REGION_{i,x8} + \beta_{25}REGION_{i,x9} + \beta_{26}REGION_{i,x10} + \beta_{27}LISTED_{i,x} + \beta_{28}SECTOR_{i,x1} + \beta_{29}SECTOR_{i,x2} + \\ & \beta_{30}SECTOR_{i,x3} + \varepsilon_{i,x} \end{aligned}$$

The results are based on 18,019 observations. The F value is modest at 85.18, while results for the model are statistically significant. This suggests the model can be moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.1133, which is not particularly strong.

Otherwise, the model shows virtually the same results and, therefore, the same weaknesses as those discussed in relation to DEBT/TOAS as the dependent variable. Several of the variables (income, region) reflect biased estimates. Moreover, several of the variables show high VIV and low Tolerance estimates, while other variables are not statistically significant. Collinearity issues are particularly problematic for emerging markets, all four results for Asia-Pacific and Europe, and three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV). Meanwhile, there are no results for South Asia, and results for African and the Caribbean are not statistically significant. Results for EBIT/TOAS are also not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the SMALL dummy is not statistically significant. However, the model results are rejected due to problems of collinearity and other weaknesses described above.

Table 25: Full Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the full model collinearity results for variable selection. The operative equation (6) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the full model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income level dummy, regional dummy, listed status dummy and sector dummy, as well as by legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Full Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	85.18	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.17325	0.85233	0.00811	1.07	0.2865
“MEDIUM”	1.10007	0.90903	-0.03255	-4.42	<.0001***
EMERGING	22.42419	0.04459	-0.23221	-6.99	<.0001***
AFRICA	1.56591	0.63860	0.00938	1.07	0.2855
CARIBBEAN	1.09265	0.91520	-0.00408	-0.56	0.5783
CENTRAL_ASIA	1.17031	0.85447	0.04420	5.82	<.0001***
EM_ASIA-PACIFIC	10.99424	0.09096	0.08648	3.72	0.0002***
EM_EUROPE	5.07963	0.19686	0.04111	2.60	0.0094***
HI_ASIA-PACIFIC	11.24056	0.08896	-0.12925	-5.49	<.0001***
HI_EUROPE	7.24638	0.13800	-0.02484	-1.31	0.1888
LATIN_AMERICA	2.34224	0.42694	0.09655	8.99	<.0001***
MIDDLE_EAST	2.60733	0.38353	0.06504	5.74	<.0001***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06860	0.93580	-0.04237	-5.84	<.0001***
AGRICULTURE	1.04384	0.95800	-0.02580	-3.60	0.0003***
RESOURCES_CONSTRUCTION	1.14257	0.87522	-0.02801	-3.73	0.0002***
MANUFACTURING	1.19660	0.83570	-0.09466	-12.33	<.0001***
CREDINFO	1.68410	0.59379	-0.03709	-4.07	<.0001***
MINSH	1.92672	0.51902	0.01800	1.85	0.0648*
PROPERTY	3.46349	0.28873	-0.00594	-0.45	0.6495
LRINDEX	1.47131	0.67966	0.03785	4.44	<.0001***
CONTRENF	3.78545	0.26417	-0.06624	-4.85	<.0001***
INSOLV	3.62317	0.27600	0.04305	3.22	0.0013***
EBIT_TOAS	1.10493	0.90503	-0.00395	-0.54	0.5925
NWC_TOAS	1.14455	0.87371	-0.14440	-19.23	<.0001***
MOVEABLE_TOAS	1.11260	0.89880	0.13250	17.89	<.0001***
DEBT_EBITDA	1.00110	0.99890	0.07975	11.35	<.0001***
IC	1.10515	0.90486	-0.09329	-12.64	<.0001***

2. Step 2: All Independent Variables and Firm Size Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 2 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all independent variables and the two firm size dummy variables, and is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \varepsilon_{i,x} \quad (7)$$

The results are based on 21,500 observations. The F value is high at 1,525.72, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4800.

There is no issue with biased estimates, and there is little issue with VIV and low Tolerance estimates. Only PROP and CONTRENF show moderately high VIV just above 2.50, while CREDINFO lacks statistical significance. Therefore, there are some issues with the legal and institutional variables in the model, while the financial independent variables are all statistically significant and present no collinearity issues in the model.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the MEDIUM dummy results are not statistically significant, and the SMALL dummy shows weak statistical significance. The model results are accepted, but with some caution due to the issues described above regarding collinearity for two of the legal and institutional variables.

Table 26: Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (7) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy, legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	1,525.72	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.14326	0.87469	0.00912	1.73	0.0829*
“MEDIUM”	1.10671	0.90358	0.00328	0.63	0.5268
CREDINFO	1.44788	0.69066	-0.01070	-1.81	0.0706*
MINSH	1.31542	0.76021	0.03439	6.10	<.0001***
PROPERTY	2.53461	0.39454	-0.01661	-2.12	0.0340**
LRINDEX	1.12125	0.89186	-0.02153	-4.13	<.0001***
CONTRENF	2.55540	0.39133	-0.02037	-2.59	0.0096***
INSOLV	1.51770	0.65889	0.02451	4.04	<.0001***
EBIT_TOAS	1.33984	0.74636	0.16682	29.30	<.0001***
NWC_TOAS	1.36704	0.73151	-0.73665	-128.07	<.0001***
MOVEABLE_TOAS	1.07912	0.92668	0.01997	3.91	<.0001***
DEBT_EBITDA	1.00032	0.99968	0.04699	9.55	<.0001***
IC	1.05100	0.95148	-0.08453	-16.76	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 2 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all independent variables and the two firm size dummy variables, and is represented by the following equation:

$$\begin{aligned} LTD_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \\ & \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \\ & \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \\ & \beta_{15} MEDIUM_{i,x} + \epsilon_{i,x} \end{aligned} \quad (8)$$

The results are based on 18,019 observations. The F value is moderately high at 129.50, and results for the model are statistically significant. This suggests the model is moderately helpful in explaining variances between groups compared to variances within those groups. The R-square is low at 0.0855, which means it may be a weak model.

There is no issue with biased estimates, and there is no issue with VIV and low Tolerance estimates. Only PROP and CONTRENF show moderately high VIV at about 2.40, while MINSH and EBIT/TOAS lack statistical significance. Therefore, there are some issues with the legal and institutional variables and one of the financial variables in the model, but no collinearity issues.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the SMALL dummy results are not statistically significant.

Table 27: Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (8) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 EBIT_{i,x} + \beta_9 FINSLACK_{i,x} + \beta_{10} IMMOVEABLE_{i,x} + \beta_{11} MOVEABLE_{i,x} + \beta_{12} DEBTBITDA_{i,x} + \beta_{13} IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \varepsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. "SMALL" and "MEDIUM" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy, legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	129.50	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.13497	0.88108	-0.00040949	-0.05	0.9570
"MEDIUM"	1.07034	0.93428	-0.03506	-4.76	<.0001***
CREDINFO	1.43851	0.69516	-0.02710	-3.17	0.0015***
MINSH	1.30857	0.76419	-0.00579	-0.71	0.4778
PROPERTY	2.42286	0.41274	0.04013	3.62	0.0003***
LRINDEX	1.10344	0.90626	0.03389	4.53	<.0001***
CONTRENF	2.39406	0.41770	-0.09200	-8.34	<.0001***
INSOLV	1.49102	0.67068	0.05992	6.89	<.0001***
EBIT_TOAS	1.09970	0.90934	-0.00265	-0.35	0.7227
NWC_TOAS	1.12935	0.88547	-0.15733	-20.77	<.0001***
MOVEABLE_TOAS	1.08998	0.91745	0.13181	17.72	<.0001***
DEBT_EBITDA	1.00044	0.99956	0.08002	11.23	<.0001***
IC	1.07996	0.92596	-0.10772	-14.54	<.0001***

3. Step #3: All Legal and Institutional Variables and Dummy Variables

a) DEBT/ASSETS as Dependent Variable

The Step 3 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all legal and institutional variables and all dummy variables, thereby including all independent variables except financial variables. This is represented by the following equation:

$$\begin{aligned}
 DEBT_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \\
 & \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \\
 & \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \\
 & \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \\
 & \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \varepsilon_{i,x}
 \end{aligned} \tag{9}$$

The results are based on 27,927 observations. The F value is low at 21.83, although results for the model are statistically significant. This suggests the model would not be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also a very low 0.0169, implying the model has very limited explanatory power.

There are many problems with the model, starting with biased estimates for several of the variables (income level, most regions), high VIV and low Tolerance estimates for a majority of the dummy variables, and a lack of statistical significance for many other variables. Collinearity issues are problematic for

emerging markets, six of 10 regions, and three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV). Meanwhile, there are no results for South Asia, results for Africa and the Caribbean are not statistically significant, and results for all three sectors plus three of six legal and institutional variables (CREDINFO, LRINDEX, CONTRENF) also lack statistical significance.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show that neither of the firm size dummy results are statistically significant. However, the model is rejected due to problems of collinearity and other weaknesses in the model described above.

Table 28: All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (9) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and legal and institutional variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	27,927	21.83	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.17708	0.84956	0.04180	6.49	<.0001***
“MEDIUM”	1.11506	0.89681	-0.01960	-3.13	0.0018***
EMERGING	21.90504	0.04565	-0.21254	-7.65	<.0001***
AFRICA	1.56895	0.63737	-0.00224	-0.30	0.7628
CARIBBEAN	1.07729	0.92826	-0.00618	-1.00	0.3156
CENTRAL_ASIA	1.20226	0.83177	0.01847	2.84	0.0045***
EM_ASIA-PACIFIC	11.25776	0.08883	0.09760	4.90	<.0001***
EM_EUROPE	4.53822	0.22035	0.08004	6.33	<.0001***
HI_ASIA-PACIFIC	3.73223	0.26794	-0.06942	-6.05	<.0001***
HI_EUROPE	3.03858	0.32910	-0.03936	-3.80	0.0001***
LATIN_AMERICA	2.07925	0.48094	0.03096	3.62	0.0003***
MIDDLE_EAST	2.64383	0.37824	0.03544	3.67	0.0002***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06335	0.94042	-0.03791	-6.19	<.0001***
AGRICULTURE	1.04115	0.96048	-0.00259	-0.43	0.6691
RESOURCES_CONSTRUCTION	1.11952	0.89324	0.00085730	0.14	0.8914
MANUFACTURING	1.16864	0.85570	-0.00560	-0.87	0.3824
CREDINFO	1.77033	0.56487	0.00410	0.52	0.6037
MINSH	1.69208	0.59099	0.03741	4.85	<.0001***
PROPERTY	3.72043	0.26879	-0.08929	-7.80	<.0001***
LRINDEX	2.05972	0.48550	0.00442	0.52	0.6036
CONTRENF	3.50886	0.28499	-0.01666	-1.50	0.1339
INSOLV	3.96538	0.25218	-0.07237	-6.12	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 3 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all legal and institutional variables and all dummy variables, thereby including all independent variables except financial variables. This is represented by the following equation:

$$\begin{aligned} LTD_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \\ & \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \\ & \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \\ & \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \\ & \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \varepsilon_{i,x} \end{aligned} \quad (10)$$

The results are based on 23,860 observations. The F value is moderate at 79.08, and results for the model are statistically significant. This suggests the model would be moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is low at 0.0680, implying the model has limited explanatory power.

There are many problems with the model, starting with biased estimates for several of the variables (income level, most regions), high VIF and low Tolerance estimates for many of the dummy variables, and a lack of statistical significance for some of the other variables. Collinearity issues are problematic for emerging markets, four of 10 regions, and three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV). Meanwhile, there are no results for South Asia, results for Africa and the Caribbean are not statistically significant, and results for INSOLV also lack statistical significance while CONTRENF only showed weak statistical significance.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the SMALL firm size dummy is not statistically significant. However, the model is rejected due to problems of collinearity and other weaknesses in the model described above.

Table 29: All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (10) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and legal and institutional variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	23,860	79.08	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.16671	0.85711	0.00444	0.66	0.5111
“MEDIUM”	1.07705	0.92846	-0.05098	-7.86	<.0001***
EMERGING	21.52044	0.04647	-0.27596	-9.51	<.0001***
AFRICA	1.57298	0.63574	0.00717	0.91	0.3603
CARIBBEAN	1.07934	0.92649	-0.00626	-0.96	0.3353
CENTRAL_ASIA	1.20132	0.83242	0.02986	4.36	<.0001***
EM_ASIA-PACIFIC	9.94615	0.10054	0.04198	2.13	0.0333**
EM_EUROPE	4.52887	0.22081	0.03461	2.60	0.0093***
HI_ASIA-PACIFIC	3.63333	0.27523	-0.22889	-19.20	<.0001***
HI_EUROPE	3.03443	0.32955	-0.06138	-5.64	<.0001***
LATIN_AMERICA	2.19123	0.45636	0.08212	8.87	<.0001***
MIDDLE_EAST	2.49724	0.40044	0.04814	4.87	<.0001***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06495	0.93901	-0.04030	-6.25	<.0001***
AGRICULTURE	1.04032	0.96124	-0.02479	-3.89	0.0001***
RESOURCES_CONSTRUCTION	1.11541	0.89653	-0.02018	-3.06	0.0022***
MANUFACTURING	1.16345	0.85951	-0.09129	-13.54	<.0001***
CREDINFO	1.78203	0.56116	-0.02715	-3.25	0.0011***
MINSH	1.68185	0.59458	0.02884	3.56	0.0004***
PROPERTY	3.52495	0.28369	-0.03842	-3.27	0.0011***
LRINDEX	2.05680	0.48619	0.05704	6.36	<.0001***
CONTRENF	3.30182	0.30286	-0.02015	-1.77	0.0762*
INSOLV	3.9032	0.25620	-0.01220	-0.99	0.3234

4. Step #4: All Financial Independent Variables and Dummy Variables

a) DEBT/ASSETS as Dependent Variable

The Step 4 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial variables and all dummy variables, thereby including all independent variables except legal and institutional variables. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \beta_{10} REGION_{i,x1} + \beta_{11} REGION_{i,x2} + \beta_{12} REGION_{i,x3} + \beta_{13} REGION_{i,x4} + \beta_{14} REGION_{i,x5} + \beta_{15} REGION_{i,x6} + \varepsilon_{i,x} \quad (11)$$

$$\beta_{16}REGION_{i,x7} + \beta_{17}REGION_{i,x8} + \beta_{18}REGION_{i,x9} + \beta_{19}REGION_{i,x10} + \beta_{20}LISTED_{i,x} + \beta_{21}SECTOR_{i,x1} + \beta_{22}SECTOR_{i,x2} + \beta_{23}SECTOR_{i,x3} + \epsilon_{i,x}$$

The results are based on 21,500 observations. The F value is high at 955.79, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4831, implying the model has explanatory power.

Despite these strengths, there are several problems with the model, starting with biased estimates for several of the variables (income level, most regions), high VIF and low Tolerance estimates for the income level dummy and three of the regional dummy variables. All three sector dummies also lack statistical significance. Meanwhile, there are no results for South Asia.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the MEDIUM firm size dummy is not statistically significant. However, the model is rejected due to problems of collinearity and other weaknesses in the model described above.

Table 30: All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (11) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \beta_{10}REGION_{i,x1} + \beta_{11}REGION_{i,x2} + \beta_{12}REGION_{i,x3} + \beta_{13}REGION_{i,x4} + \beta_{14}REGION_{i,x5} + \beta_{15}REGION_{i,x6} + \beta_{16}REGION_{i,x7} + \beta_{17}REGION_{i,x8} + \beta_{18}REGION_{i,x9} + \beta_{19}REGION_{i,x10} + \beta_{20}LISTED_{i,x} + \beta_{21}SECTOR_{i,x1} + \beta_{22}SECTOR_{i,x2} + \beta_{23}SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	955.79	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.15047	0.86921	0.01328	2.52	0.0116**
“MEDIUM”	1.11483	0.89700	-0.00250	-0.48	0.6300
EMERGING	13.71118	0.07293	-0.04870	-2.68	0.0074***
AFRICA	1.32998	0.75189	-0.03629	-6.41	<.0001***
CARIBBEAN	1.03093	0.97000	-0.01174	-2.36	0.0185**
CENTRAL_ASIA	1.04044	0.96113	0.01055	2.11	0.0350**
EM_ASIA-PACIFIC	3.86189	0.25894	-0.02240	-2.32	0.0202**
EM_EUROPE	1.89557	0.52754	-0.06002	-8.89	<.0001***
HI_ASIA-PACIFIC	8.79133	0.11375	-0.05838	-4.01	<.0001***
HI_EUROPE	6.00857	0.16643	-0.05338	-4.44	<.0001***
LATIN_AMERICA	1.55604	0.64266	-0.01194	-1.95	0.0511*
MIDDLE_EAST	1.57580	0.63460	-0.01579	-2.56	0.0104**
SOUTH_ASIA	.	.	.	.	.
LISTED	1.05314	0.94954	-0.03443	-6.84	<.0001***
AGRICULTURE	1.04180	0.95988	-0.00021600	-0.04	0.9656
RESOURCES_CONSTRUCTION	1.13561	0.88058	-0.00141	-0.27	0.7868
MANUFACTURING	1.16626	0.85744	0.00817	1.54	0.1232
EBIT_TOAS	1.33788	0.74745	0.16735	29.49	<.0001***
NWC_TOAS	1.37394	0.72783	-0.73766	-128.28	<.0001***
MOVEABLE_TOAS	1.07795	0.92768	0.01884	3.70	0.0002***
DEBT_EBITDA	1.00085	0.99915	0.04739	9.66	<.0001***
IC	1.05521	0.94768	-0.08326	-16.52	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 4 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial variables and all dummy variables, thereby including all independent variables except legal and institutional variables. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \beta_{10}REGION_{i,x1} + \beta_{11}REGION_{i,x2} + \beta_{12}REGION_{i,x3} + \beta_{13}REGION_{i,x4} + \beta_{14}REGION_{i,x5} + \beta_{15}REGION_{i,x6} + \beta_{16}REGION_{i,x7} + \beta_{17}REGION_{i,x8} + \beta_{18}REGION_{i,x9} + \beta_{19}REGION_{i,x10} + \beta_{20}LISTED_{i,x} + \beta_{21}SECTOR_{i,x1} + \beta_{22}SECTOR_{i,x2} + \beta_{23}SECTOR_{i,x3} + \varepsilon_{i,x} \quad (12)$$

The results are based on 18,019 observations. The F value is moderately high at 103.87, and results for the model are statistically significant. This suggests the model would be moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.1081, implying the model has limited explanatory power.

There are several problems with the model, starting with biased estimates for several of the variables (income level, most regions), high VIF and low Tolerance estimates for the income level dummy and three of the regional dummy variables. One of the financial variables (EBIT/TOAS) also lacks statistical significance, and there are no results for South Asia.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model also results show the SMALL firm size dummy is not statistically significant. However, the model is rejected due to problems of collinearity and other weaknesses in the model described above.

Table 31: All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (12) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMM\text{OVEABLE}_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \beta_{10}REGION_{i,x1} + \beta_{11}REGION_{i,x2} + \beta_{12}REGION_{i,x3} + \beta_{13}REGION_{i,x4} + \beta_{14}REGION_{i,x5} + \beta_{15}REGION_{i,x6} + \beta_{16}REGION_{i,x7} + \beta_{17}REGION_{i,x8} + \beta_{18}REGION_{i,x9} + \beta_{19}REGION_{i,x10} + \beta_{20}LISTED_{i,x} + \beta_{21}SECTOR_{i,x1} + \beta_{22}SECTOR_{i,x2} + \beta_{23}SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	103.87	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.15155	0.86839	0.01104	1.46	0.1439
“MEDIUM”	1.08914	0.91816	-0.03761	-5.12	<.0001***
EMERGING	13.02293	0.07679	-0.21373	-8.41	<.0001***
AFRICA	1.31831	0.75855	-0.01228	-1.52	0.1288
CARIBBEAN	1.03364	0.96746	-0.00527	-0.74	0.4613
CENTRAL_ASIA	1.04280	0.95896	0.03242	4.51	<.0001***
EM_ASIA-PACIFIC	3.56047	0.28086	-0.01237	-0.93	0.3516
EM_EUROPE	1.88428	0.53071	0.00089395	0.09	0.9263
HI_ASIA-PACIFIC	8.43733	0.11852	-0.17524	-8.57	<.0001***
HI_EUROPE	6.00576	0.16651	-0.05969	-3.46	0.0005***
LATIN_AMERICA	1.60085	0.62467	0.05911	6.64	<.0001***
MIDDLE_EAST	1.53913	0.64972	0.01550	1.77	0.0760*
SOUTH_ASIA	.	.	.	.	.
LISTED	1.05859	0.94466	-0.04060	-5.61	<.0001***
AGRICULTURE	1.04068	0.96091	-0.02866	-3.99	<.0001***
RESOURCES_CONSTRUCTION	1.13651	0.87989	-0.02705	-3.60	0.0003***
MANUFACTURING	1.16790	0.85623	-0.10441	-13.72	<.0001***
EBIT_TOAS	1.10167	0.90772	-0.00468	-0.63	0.5264
NWC_TOAS	1.13895	0.87800	-0.14340	-19.09	<.0001***
MOVEABLE_TOAS	1.08973	0.91766	0.13424	18.27	<.0001***
DEBT_EBITDA	1.00099	0.99901	0.08020	11.39	<.0001***
IC	1.08342	0.92301	-0.08784	-11.99	<.0001***

5. Step #5: All Financial Variables and Firm Size Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 5 model testing financial independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMM\text{OVEABLE}_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \epsilon_{i,x} \quad (13)$$

The results are based on 21,500 observations. The F value is high at 2,806.48, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4776, implying the model has

explanatory power. The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show that neither of the firm size dummies is statistically significant.

Table 32: All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (13) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	2,806.48	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.04964	0.95271	0.00752	1.49	0.1366
“MEDIUM”	1.04490	0.95703	-0.00553	-1.10	0.2729
EBIT_TOAS	1.32761	0.75323	0.16578	29.18	<.0001***
NWC_TOAS	1.35895	0.73586	-0.73569	-128.00	<.0001***
MOVEABLE_TOAS	1.03248	0.96854	0.02016	4.02	<.0001***
DEBT_EBITDA	1.00015	0.99985	0.04709	9.55	<.0001***
IC	1.03085	0.97007	-0.08244	-16.47	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 5 model testing financial independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \varepsilon_{i,x} \quad (14)$$

The results are based on 18,019 observations. The F value is high at 214.67, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. However, the R-square is low at 0.0770, implying the model has limited explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. However, EBIT/TOAS is not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results show the SMALL firm size dummy is not statistically significant.

Table 33: All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (14) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \epsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	214.67	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.04773	0.95444	0.00352	0.48	0.6305
“MEDIUM”	1.03663	0.96466	-0.04729	-6.49	<.0001***
EBIT_TOAS	1.08573	0.92104	-0.00518	-0.69	0.4878
NWC_TOAS	1.12232	0.89101	-0.15802	-20.84	<.0001***
MOVEABLE_TOAS	1.04361	0.95821	0.13090	17.90	<.0001***
DEBT_EBITDA	1.00021	0.99979	0.08065	11.27	<.0001***
IC	1.04779	0.95439	-0.09763	-13.32	<.0001***

6. Step #6: All Financial Variables and Firm Size Dummies with Income Level Dummy

a) DEBT/ASSETS as Dependent Variable

The Step 6 model testing financial independent variables and firm size and income level dummies in relation to DEBT/ASSETS as the dependent variable is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x} \quad (15)$$

The results are based on 21,500 observations. The F value is high at 2,458.12, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4776, implying the model has explanatory power. The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the MEDIUM firm size dummy is not statistically significant.

Table 34: Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (15) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	2,458.12	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.08688	0.92006	0.01064	2.07	0.0385**
“MEDIUM”	1.08973	0.91766	-0.00211	-0.41	0.6821
EMERGING	1.08611	0.92072	-0.01682	-3.27	0.0011***
EBIT_TOAS	1.33164	0.75095	0.16680	29.32	<.0001***
NWC_TOAS	1.35912	0.73577	-0.73590	-128.06	<.0001***
MOVEABLE_TOAS	1.04551	0.95647	0.02200	4.37	<.0001***
DEBT_EBITDA	1.00016	0.99984	0.04714	9.56	<.0001***
IC	1.03397	0.96714	-0.08334	-16.63	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 6 model testing financial independent variables and firm size and income level dummies in relation to LTD/ASSETS as the dependent variable is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x} \quad (16)$$

The results are based on 18,019 observations. The F value is moderately high at 197.65, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. However, the R-square is low at 0.0807, implying the model has limited explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. However, the EBIT/TOAS variable is not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies show statistical significance.

Table 35: Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (16) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	197.65	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.08679	0.92014	0.01555	2.09	0.0368**
“MEDIUM”	1.07102	0.93369	-0.03600	-4.87	<.0001***
EMERGING	1.09721	0.91140	-0.06375	-8.52	<.0001***
EBIT_TOAS	1.09475	0.91345	0.00060442	0.08	0.9356
NWC_TOAS	1.12253	0.89084	-0.15891	-20.99	<.0001***
MOVEABLE_TOAS	1.06104	0.94247	0.13893	18.88	<.0001***
DEBT_EBITDA	1.00024	0.99976	0.08098	11.33	<.0001***
IC	1.05782	0.94534	-0.10373	-14.12	<.0001***

7. Step #7: All Financial Variables and Firm Size Dummies with Regional Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 7 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial variables, the two firm size dummy variables and all regional dummy variables. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9REGION_{i,x1} + \beta_{10}REGION_{i,x2} + \beta_{11}REGION_{i,x3} + \beta_{12}REGION_{i,x4} + \beta_{13}REGION_{i,x5} + \beta_{14}REGION_{i,x6} + \beta_{15}REGION_{i,x7} + \beta_{16}REGION_{i,x8} + \beta_{17}REGION_{i,x9} + \beta_{18}REGION_{i,x10} + \varepsilon_{i,x} \quad (17)$$

The results are based on 21,500 observations. The F value is high at 1,175.34, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4819, implying the model has explanatory power.

Despite these strengths, there are several problems with the model. Five (all four Europe and Asia-Pacific regions combined with South Asia) of the 10 regions show high VIV and low Tolerance estimates. Meanwhile, results for Central Asia are not statistically significant.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the MEDIUM firm size dummy is not statistically significant. However, the model is rejected due to problems of collinearity and other weaknesses in the model described above.

Table 36: Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (17) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9REGION_{i,x1} + \beta_{10}REGION_{i,x2} + \beta_{11}REGION_{i,x3} + \beta_{12}REGION_{i,x4} + \beta_{13}REGION_{i,x5} + \beta_{14}REGION_{i,x6} + \beta_{15}REGION_{i,x7} + \beta_{16}REGION_{i,x8} + \beta_{17}REGION_{i,x9} + \beta_{18}REGION_{i,x10} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, regional dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	1,175.34	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.14817	0.87095	0.01349	2.56	0.0104**
“MEDIUM”	1.11235	0.89900	-0.00183	-0.35	0.7235
AFRICA	2.11240	0.47339	-0.05435	-7.62	<.0001***
CARIBBEAN	1.10568	0.90442	-0.01741	-3.37	0.0007***
CENTRAL_ASIA	1.13003	0.88493	0.00496	0.95	0.3425
EM_ASIA-PACIFIC	10.54233	0.09486	-0.07410	-4.65	<.0001***
EM_EUROPE	4.06224	0.24617	-0.09092	-9.19	<.0001***
HI_ASIA-PACIFIC	8.60900	0.11616	-0.06291	-4.37	<.0001***
HI_EUROPE	5.90252	0.16942	-0.05677	-4.76	<.0001***
LATIN_AMERICA	2.63149	0.38001	-0.02730	-3.43	0.0006***
MIDDLE_EAST	2.92101	0.34235	-0.03897	-4.64	<.0001***
SOUTH_ASIA	4.01094	0.24932	-0.02940	-2.99	0.0028***
EBIT_TOAS	1.33702	0.74793	0.16731	29.46	<.0001***
NWC_TOAS	1.36859	0.73068	-0.73888	-128.61	<.0001***
MOVEABLE_TOAS	1.07430	0.93084	0.01959	3.85	0.0001***
DEBT_EBITDA	1.00021	0.99979	0.04713	9.60	<.0001***
IC	1.05458	0.94825	-0.08357	-16.57	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 7 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial variables, the two firm size dummy variables and all regional dummy variables. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9REGION_{i,x1} + \beta_{10}REGION_{i,x2} + \beta_{11}REGION_{i,x3} + \beta_{12}REGION_{i,x4} + \beta_{13}REGION_{i,x5} + \beta_{14}REGION_{i,x6} + \beta_{15}REGION_{i,x7} + \beta_{16}REGION_{i,x8} + \beta_{17}REGION_{i,x9} + \beta_{18}REGION_{i,x10} + \varepsilon_{i,x} \quad (18)$$

The results are based on 18,019 observations. The F value is moderately high at 113.52, and results for the model are statistically significant. This suggests the model would be moderately helpful in explaining variances between groups compared to variances within those groups. The R-square is relatively low at 0.0968, implying the model has weak explanatory power.

There are several problems with the model. Five (all four Europe and Asia-Pacific regions combined with South Asia) of the 10 regions show high VIV and low Tolerance estimates. Meanwhile, results for Central

Asia are not statistically significant. In addition, results for the EBIT/ASSETS variable are not statistically significant.

The results of the model indicate that MEDIUM firms have a greater effect than SMALL firms on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 37: Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (18) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMM\text{OVEABLE}_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9REGION_{i,x1} + \beta_{10}REGION_{i,x2} + \beta_{11}REGION_{i,x3} + \beta_{12}REGION_{i,x4} + \beta_{13}REGION_{i,x5} + \beta_{14}REGION_{i,x6} + \beta_{15}REGION_{i,x7} + \beta_{16}REGION_{i,x8} + \beta_{17}REGION_{i,x9} + \beta_{18}REGION_{i,x10} + \epsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. "SMALL" and "MEDIUM" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, regional dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	113.52	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.14944	0.86999	0.01562	2.06	0.0397**
"MEDIUM"	1.08636	0.92050	-0.03472	-4.70	<.0001***
AFRICA	1.98841	0.50292	-0.08339	-8.35	<.0001***
CARIBBEAN	1.10656	0.90371	-0.02805	-3.77	0.0002***
CENTRAL_ASIA	1.12988	0.88505	0.00737	0.98	0.3276
EM_ASIA-PACIFIC	8.95920	0.11162	-0.22328	-10.53	<.0001***
EM_EUROPE	3.82356	0.26154	-0.12356	-8.92	<.0001***
HI_ASIA-PACIFIC	8.24484	0.12129	-0.19109	-9.40	<.0001***
HI_EUROPE	5.89000	0.16978	-0.06397	-3.72	0.0002***
LATIN_AMERICA	2.64196	0.37851	-0.02276	-1.98	0.0480**
MIDDLE_EAST	2.65693	0.37637	-0.07865	-6.81	<.0001***
SOUTH_ASIA	3.79774	0.26331	-0.13313	-9.64	<.0001***
EBIT_TOAS	1.10096	0.90830	-0.00249	-0.34	0.7375
NWC_TOAS	1.12974	0.88516	-0.15303	-20.33	<.0001***
MOVEABLE_TOAS	1.08598	0.92083	0.12974	17.58	<.0001***
DEBT_EBITDA	1.00030	0.99970	0.08108	11.44	<.0001***
IC	1.08301	0.92335	-0.08694	-11.79	<.0001***

8. Step #8: All Financial Variables and Firm Size Dummies with Listed Status Dummy

a) DEBT/ASSETS as Dependent Variable

The Step 8 model testing financial independent variables and firm size and listed status dummies in relation to DEBT/ASSETS as the dependent variable is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMM\text{OVEABLE}_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9LISTED_{i,x} + \epsilon_{i,x} \quad (19)$$

The results are based on 21,500 observations. The F value is high at 2,468.71, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4789, implying the model has explanatory power. The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results show that neither firm size dummy is statistically significant.

Table 38: Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (19) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9LISTED_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, listed status dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	2,468.71	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.04965	0.95270	0.00741	1.47	0.1420
“MEDIUM”	1.04514	0.95681	-0.00609	-1.21	0.2263
LISTED	1.00445	0.99557	-0.03660	-7.42	<.0001***
EBIT_TOAS	1.32768	0.75319	0.16546	29.16	<.0001***
NWC_TOAS	1.36177	0.73434	-0.73375	-127.69	<.0001***
MOVEABLE_TOAS	1.03285	0.96820	0.01946	3.89	0.0001***
DEBT_EBITDA	1.00015	0.99985	0.04719	9.58	<.0001***
IC	1.03158	0.96939	-0.08145	-16.29	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 8 model testing financial independent variables and firm size and listed status dummies in relation to LTD/ASSETS as the dependent variable is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9LISTED_{i,x} + \varepsilon_{i,x} \quad (20)$$

The results are based on 18,019 observations. The F value is moderately high at 197.21, and results for the model are statistically significant. This suggests the model would be moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is relatively low at 0.0805, implying the model has limited explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. However, the results for EBIT/ASSETS are not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results show the SMALL firm size dummy is not statistically significant.

Table 39: Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (20) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9LISTED_{i,x} + \epsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. "SMALL" and "MEDIUM" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, listed status dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	197.21	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.04774	0.95443	0.00330	0.45	0.6515
"MEDIUM"	1.03741	0.96394	-0.04895	-6.73	<.0001***
LISTED	1.00559	0.99444	-0.05967	-8.33	<.0001***
EBIT_TOAS	1.08576	0.92102	-0.00547	-0.74	0.4623
NWC_TOAS	1.12605	0.88806	-0.15439	-20.36	<.0001***
MOVEABLE_TOAS	1.04377	0.95807	0.13015	17.83	<.0001***
DEBT_EBITDA	1.00023	0.99977	0.08087	11.32	<.0001***
IC	1.04816	0.95405	-0.09649	-13.19	<.0001***

9. Step #9: All Financial Variables and Firm Size Dummies with Sector Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 9 model testing independent variables and firm size and sector dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x} \quad (21)$$

The results are based on 21,500 observations. The F value is high at 1,965.05, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4777, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. Financial independent variables are also statistically significant. However, the results for two of three sectors are not statistically significant while Manufacturing shows weak statistical significance.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results show neither firm size dummy is statistically significant.

Table 40: Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (21) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. "SMALL" and "MEDIUM" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	1,965.05	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.05155	0.95098	0.00789	1.56	0.1187
"MEDIUM"	1.04717	0.95495	-0.00529	-1.05	0.2943
AGRICULTURE	1.03684	0.96447	-0.00085557	-0.17	0.8647
RESOURCES_CONSTRUCTION	1.11671	0.89549	0.00251	0.48	0.6306
MANUFACTURING	1.14675	0.87203	0.01035	1.96	0.0501**
EBIT_TOAS	1.32854	0.75270	0.16607	29.22	<.0001***
NWC_TOAS	1.36267	0.73385	-0.73626	-127.93	<.0001***
MOVEABLE_TOAS	1.03559	0.96563	0.01961	3.91	<.0001***
DEBT_EBITDA	1.00074	0.99926	0.04722	9.57	<.0001***
IC	1.03200	0.96899	-0.08266	-16.50	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 9 model testing independent variables and firm size and sector dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x} \quad (22)$$

The results are based on 18,019 observations. The F value is moderately high at 176.41, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.0892, implying the model has limited explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All three results for sectors are statistically significant. However, the results for EBIT/ASSETS are not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a

positive correlation between firm size and credit access. The model results also show the SMALL firm size dummy is not statistically significant.

Table 41: Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (22) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. "SMALL" and "MEDIUM" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	176.41	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.04926	0.95305	0.00053950	0.07	0.9410
"MEDIUM"	1.03856	0.96287	-0.04891	-6.75	<.0001***
AGRICULTURE	1.03541	0.96580	-0.03011	-4.16	<.0001***
RESOURCES_CONSTRUCTION	1.11600	0.89606	-0.01959	-2.61	0.0091***
MANUFACTURING	1.14758	0.87140	-0.11638	-15.28	<.0001***
EBIT_TOAS	1.08678	0.92015	-0.00740	-1.00	0.3181
NWC_TOAS	1.12886	0.88585	-0.14935	-19.77	<.0001***
MOVEABLE_TOAS	1.04679	0.95531	0.13637	18.74	<.0001***
DEBT_EBITDA	1.00085	0.99915	0.07934	11.15	<.0001***
IC	1.04858	0.95367	-0.09748	-13.39	<.0001***

E. 2-Pairwise t-Test

The ANOVA tests above confirmed there is a firm size effect in relation to credit access. A supplementary test was run to determine if firms *within* each revenue quantile face differences in access to credit in general (DEBT/ASSETS) as opposed to long-term credit (LTD/ASSETS). Two pairwise t-tests were run for each of the different firm sizes for each dependent variable (i.e., test the mean differences of credit and LTD access across the three sizes) to serve as justification for testing of the subsequent hypotheses. The results confirm there are differences within each revenue quantile, and that the results are statistically significant. Table 42 below presents the results confirming there is a difference justifying subsequent testing.

Table 42: Results of 2-Pairwise t-test by Firm Size for DEBT/ASSETS vs. LTD/ASSETS as Dependent Variables

This table presents results from the 2-pairwise t-test of credit access by firm size as specified by Revenue Quantile (i.e., small, medium, large). Column (1) presents DF. Column (2) presents t-values. Column (3) presents statistical significance. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Dependent Variables: DEBT/ASSETS vs. LTD/ASSETS			
	(1) DF	(2) t-values	(3) Pr > (t)
SMALL	1,955	9.90	<.0001***
MEDIUM	5,367	74.32	<.0001***
LARGE	16,502	98.57	<.0001***

F. Main Observations

The statistical tests partly confirm the underlying premise of the research, that there is a positive correlation between firm size and credit access. Univariate results provide considerable support for the premise based on mean and median figures across firm sizes, including when tested by category (e.g., income level, region, listed status, sector). There are periodic deviations, but general patterns are broadly confirmed.

Meanwhile, baseline linear regression tests broadly confirmed there is a firm size effect, as reflected in standardized estimates for firm size categories that also test for joint effects when testing for firm size and additional categories of interest. However, in most of the model results, at least one firm size dummy is not statistically significant. Among the 11 accepted results, SMALL was not statistically significant in four cases, MEDIUM in two cases, and neither in three cases. In the two cases when firm size dummies are uniformly statistically significant, the firm size effect is confirmed. In general, firm size effect was confirmed in six of 11 accepted cases. Therefore, in terms of overall results as well as the importance of firm size dummy variables in relation to the dependent variable, the results are mixed. The 2-pairwise *t*-test likewise confirms that there are differences in access to type of credit within each revenue quantile, further justifying the rationale to test for underlying explanations about why there are differences. However, the baseline regression results show modest support for the premise.

While results offer broad confirmation of underlying premises for hypothesis testing, there are weaknesses in the data. ANOVA exposed problems of statistical significance for categories of interest, while regressions demonstrated heteroscedasticity in variances rather than constant variances (see Annex 4). In the latter case, this is not unusual for large cross-sectional data sets. White Test results for heteroscedasticity also serve as a basis for running log transformation results as a robustness test observe results under a normal distribution (see Section 5).

Notwithstanding weaknesses, the results provided sufficient justification for proceeding with hypothesis testing and robustness tests (Sections 5 and 6). Moreover, the ANOVA results also highlighted the higher F-values for dependent values with assets (DEBT/ASSETS and LTD/ASSETS) as opposed to regressing independent variables to the financial figures for the dependent variables (DEBT and LTD). As four of the six financial independent variables are also ratios reflecting items of interest (e.g., EBIT, NWC, IMM, MOV) in relation to assets, the results provide a rationale for streamlining the dependent variables from four to two and running the hypothesis tests (including the robustness tests) with DEBT/ASSETS and LTD/ASSETS as the dependent variables.

V. Statistical Tests and Results—Log Transformation Robustness Tests

A. Introduction

This section presents results from regression results that replicate Section 4. These results are from an adjusted sample based on a log transformation by OPRE (revenue quantile) category to eliminate the effects of outliers on the sample distribution. Similar to the approach followed for the baseline regressions, the log transformation regressions compare coefficients of credit access by firm size based on the revenue quantile definitions used in this research in addition to two associated dummy variables (“SMALL” and “MEDIUM”) to test for firm size effect. However, the robustness tests are based on a normal distribution. This results in a significant number of missing observations which affects the distribution. Nonetheless, the problems of skewness and kurtosis that affected the Level 2 distribution prior to adjustments is remedied with the log transformation.

B. Regression Results for OPRE Log Transformation

As in Section 4, the log transformation regressions are carried out in nine steps, starting with the dependent variable on the left-hand side of the equation and all independent variables and dummy variables for all categories of interest (e.g., income level, region, listed status, sector) on the right-hand side of the equation. Therefore, the test starts by running the aggregated model on the full sample only, allowing the coefficients to vary between small, medium, and large firms by using category dummies and interactive terms with the dummies. The results identify where test results are likely to have the greatest effectiveness in explaining the effects of the independent variables on dependent variables. In this case as a robustness test, the results are compared with results from the baseline regressions.

The subsequent steps ultimately continue these tests to provide explanations of the effects of the independent variables on dependent variables based on categories of interest. The operative equations for each of the nine steps for the log transformation results are presented in Table 43 below.

Table 43: Overview of All Log Transformation Regression Equations

This table provides all the equations used in the log transformation regressions. Panel (1) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all independent variables and dummy variables on the right-hand side. Panel (2) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all independent variables (including those with log transformation values) and firm size dummy variables on the right-hand side. Panel (2) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all independent variables (including those with log transformation values) and firm size dummy variables on the right-hand side. Panel (3) provides the equations for logDEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all legal and institutional independent variables and dummy variables on the right-hand side. Panel (4) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and dummy variables on the right-hand side. Panel (5) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and firm size dummy variables on the right-hand side. Panel (6) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and firm size dummy variables and income dummy on the right-hand side. Panel (7) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and firm size dummy variables and regional dummies on the right-hand side. Panel (8) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and firm size dummy variables and listed status dummy on the right-hand side. Panel (9) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and firm size dummy variables and sector dummies on the right-hand side. Step number corresponds to the step number for the testing. Equation number applies to econometric specifications for each test.

Step No.	Equation	Equation No.
1	Panel 1: All Independent Variables and All Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBTBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \epsilon_{i,x}$	(23)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBTBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \epsilon_{i,x}$	(24)
2	Panel 2: All Independent Variables and Firm Size Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBTBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \epsilon_{i,x}$	(25)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBTBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \epsilon_{i,x}$	(26)
3	Panel 3: All Legal and Institutional Independent Variables and All Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \epsilon_{i,x}$	(27)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \epsilon_{i,x}$	(28)
4	Panel 4: All Financial Independent Variables and All Dummies	

	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \beta_{10} REGION_{i,x1} + \beta_{11} REGION_{i,x2} + \beta_{12} REGION_{i,x3} + \beta_{13} REGION_{i,x4} + \beta_{14} REGION_{i,x5} + \beta_{15} REGION_{i,x6} + \beta_{16} REGION_{i,x7} + \beta_{17} REGION_{i,x8} + \beta_{18} REGION_{i,x9} + \beta_{19} REGION_{i,x10} + \beta_{20} LISTED_{i,x} + \beta_{21} SECTOR_{i,x1} + \beta_{22} SECTOR_{i,x2} + \beta_{23} SECTOR_{i,x3} + \epsilon_{i,x}$	(29)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \beta_{10} REGION_{i,x1} + \beta_{11} REGION_{i,x2} + \beta_{12} REGION_{i,x3} + \beta_{13} REGION_{i,x4} + \beta_{14} REGION_{i,x5} + \beta_{15} REGION_{i,x6} + \beta_{16} REGION_{i,x7} + \beta_{17} REGION_{i,x8} + \beta_{18} REGION_{i,x9} + \beta_{19} REGION_{i,x10} + \beta_{20} LISTED_{i,x} + \beta_{21} SECTOR_{i,x1} + \beta_{22} SECTOR_{i,x2} + \beta_{23} SECTOR_{i,x3} + \epsilon_{i,x}$	(30)
5	Panel 5: All Financial Independent Variables and Firm Size Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \epsilon_{i,x}$	(31)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \epsilon_{i,x}$	(32)
6	Panel 6: All Financial Independent Variables and Firm Size Dummies and Income Dummy	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \epsilon_{i,x}$	(33)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \epsilon_{i,x}$	(34)
7	Panel 7: All Financial Independent Variables and Firm Size Dummies and Region Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 REGION_{i,x1} + \beta_{10} REGION_{i,x2} + \beta_{11} REGION_{i,x3} + \beta_{12} REGION_{i,x4} + \beta_{13} REGION_{i,x5} + \beta_{14} REGION_{i,x6} + \beta_{15} REGION_{i,x7} + \beta_{16} REGION_{i,x8} + \beta_{17} REGION_{i,x9} + \beta_{18} REGION_{i,x10} + \epsilon_{i,x}$	(35)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 REGION_{i,x1} + \beta_{10} REGION_{i,x2} + \beta_{11} REGION_{i,x3} + \beta_{12} REGION_{i,x4} + \beta_{13} REGION_{i,x5} + \beta_{14} REGION_{i,x6} + \beta_{15} REGION_{i,x7} + \beta_{16} REGION_{i,x8} + \beta_{17} REGION_{i,x9} + \beta_{18} REGION_{i,x10} + \epsilon_{i,x}$	(36)
8	Panel 8: All Financial Independent Variables and Firm Size Dummies and Listed Dummy	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 LISTED_{i,x} + \epsilon_{i,x}$	(37)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 LISTED_{i,x} + \epsilon_{i,x}$	(38)
9	Panel 9: All Financial Independent Variables and Firm Size Dummies and Sector Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$	(39)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$	(40)

Tables 44-61 below present data for the relevant variables. Firm size dummy results show results for small and medium-sized firms, with large-scale firms captured in the baseline test results. Income level dummies present emerging markets results, with high-income markets captured in the baseline test results. Regional dummies present results for all but North America, which are captured in the baseline test results. Listed status dummies present results for quoted or listed firms, with unlisted firms captured in the baseline test results. Sector dummies present results for Agriculture, R&C and Manufacturing, with Services captured in the baseline test results. These procedures are identical to the steps taken in Section 4 with the baseline regressions.

1. *Step #1: Full Model Results—All Independent Variables and Dummies*

a) *logDEBT/ASSETS as Dependent Variable*

The Step 1 model testing independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all independent variables and dummy variables, and is represented by the following equation:

$$\begin{aligned} \log DEBT_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \\ & \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \\ & \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBTEBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \\ & \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \\ & \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \\ & \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \\ & \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \epsilon_{i,x} \end{aligned} \quad (23)$$

The results are based on 13,698 observations. The F value is very high at 7,173.65, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9341, implying that the model has a high level of explanatory power.

However, several of the variables (income, regions) reflect biased estimates. Moreover, many of the variables show high VIF and low Tolerance estimates, while other variables are not statistically significant. Collinearity issues are particularly problematic for emerging markets, four of 10 regions, three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV), and one of the financial variables (logIC). Meanwhile, there are no results for South Asia, and results for four of the 10 regions are not statistically significant and two others showed weak statistical significance.

Test results show the SMALL dummy has a greater effect, which differs from the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, the model is rejected due to the multiple weaknesses described above.

Table 44: Full Model ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the full model collinearity results for variable selection. The operative equation (23) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBT EBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the full model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income level dummy, regional dummy, listed status dummy and sector dummy, as well as by legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Full Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	7,173.65	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.21054	0.82608	-0.00911	-3.77	0.0002***
“MEDIUM”	1.19533	0.83659	-0.00488	-2.03	0.0421**
EMERGING	29.08991	0.03438	-0.02716	-2.29	0.0219**
AFRICA	1.56063	0.64077	0.00611	2.23	0.0260**
CARIBBEAN	1.12472	0.88911	-0.00283	-1.22	0.2241
CENTRAL_ASIA	1.12545	0.88854	0.00893	3.83	0.0001***
EM_ASIA-PACIFIC	13.70324	0.07298	-0.00877	-1.08	0.2809
EM_EUROPE	4.66059	0.21457	0.00605	1.28	0.2017
HI_ASIA-PACIFIC	15.36412	0.06509	-0.06581	-7.65	<.0001***
HI_EUROPE	8.84626	0.11304	-0.00889	-1.36	0.1734
LATIN_AMERICA	2.36573	0.42270	-0.00632	-1.87	0.0615*
MIDDLE_EAST	2.75194	0.36338	0.00622	1.71	0.0878*
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06430	0.93958	-0.00747	-3.30	0.0010***
AGRICULTURE	1.05516	0.94772	-0.00812	-3.60	0.0003***
RESOURCES_CONSTRUCTION	1.15559	0.86536	-0.01382	-5.86	<.0001***
MANUFACTURING	1.37298	0.72834	-0.01754	-6.82	<.0001***
CREDINFO	1.80125	0.55517	-0.01044	-3.54	0.0004***
MINSH	1.93852	0.51586	-0.02908	-9.51	<.0001***
PROPERTY	4.20417	0.23786	0.03399	7.55	<.0001***
LRINDEX	1.61704	0.61841	0.01196	4.28	<.0001***
CONTRENF	4.14522	0.24124	-0.03871	-8.66	<.0001***
INSOLV	4.05880	0.24638	0.04017	9.08	<.0001***
logEBIT_TOAS	1.52760	0.65462	0.36742	135.37	<.0001***
logNWC_TOAS	1.23147	0.81204	-0.01632	-6.70	<.0001***
logMOVEABLE_TOAS	1.25250	0.79840	0.08859	36.05	<.0001***
logDEBT_EBITDA	2.32837	0.42948	1.04550	312.00	<.0001***
logIC	3.23897	0.30874	-0.01945	-4.92	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 1 model testing independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all independent variables and dummy variables, and is represented by following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBT EBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \epsilon_{i,x} \quad (24)$$

$$\begin{aligned} & \beta_{11}\log\text{MOVEABLE}_{i,x} + \beta_{12}\log\text{DEBTBITDA}_{i,x} + \beta_{13}\log\text{IC}_{i,x} + \beta_{14}\text{SMALL}_{i,x} + \beta_{15}\text{MEDIUM}_{i,x} + \\ & \beta_{16}\text{INCOME}_{i,x} + \beta_{17}\text{REGION}_{i,x1} + \beta_{18}\text{REGION}_{i,x2} + \beta_{19}\text{REGION}_{i,x3} + \beta_{20}\text{REGION}_{i,x4} + \beta_{21}\text{REGION}_{i,x5} + \\ & \beta_{22}\text{REGION}_{i,x6} + \beta_{23}\text{REGION}_{i,x7} + \beta_{24}\text{REGION}_{i,x8} + \beta_{25}\text{REGION}_{i,x9} + \beta_{26}\text{REGION}_{i,x10} + \beta_{27}\text{LISTED}_{i,x} + \\ & \beta_{28}\text{SECTOR}_{i,x1} + \beta_{29}\text{SECTOR}_{i,x2} + \beta_{30}\text{SECTOR}_{i,x3} + \varepsilon_{i,x} \end{aligned}$$

The results are based on 11,049 observations. The F value is 452.92, while results for the model are statistically significant. This suggests the model can be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.5260.

The model shows virtually the same results and, therefore, the same weaknesses as those discussed in relation to logDEBT/TOAS as the dependent variable. Many of the variables show high VIF and low Tolerance estimates, while other variables are not statistically significant. Collinearity issues are particularly problematic for emerging markets, four of 10 regions, three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV), and one of the financial variables (logIC). Meanwhile, there are no results for South Asia, although results for only one (high-income Europe) of the 10 regions are not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the SMALL dummy is not statistically significant. However, the model results are rejected due to other weaknesses described above.

Table 45: Full Model ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the full model collinearity results for variable selection. The operative equation (24) is $\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBT_EBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \beta_{16} INCOME_{i,x} + \beta_{17} REGION_{i,x1} + \beta_{18} REGION_{i,x2} + \beta_{19} REGION_{i,x3} + \beta_{20} REGION_{i,x4} + \beta_{21} REGION_{i,x5} + \beta_{22} REGION_{i,x6} + \beta_{23} REGION_{i,x7} + \beta_{24} REGION_{i,x8} + \beta_{25} REGION_{i,x9} + \beta_{26} REGION_{i,x10} + \beta_{27} LISTED_{i,x} + \beta_{28} SECTOR_{i,x1} + \beta_{29} SECTOR_{i,x2} + \beta_{30} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the full model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income level dummy, regional dummy, listed status dummy and sector dummy, as well as by legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Full Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	452.92	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.19240	0.83864	0.01025	1.43	0.1524
“MEDIUM”	1.12626	0.88789	-0.03434	-4.93	<.0001***
EMERGING	27.03097	0.03699	-0.22229	-6.52	<.0001***
AFRICA	1.57012	0.63689	0.05124	6.24	<.0001***
CARIBBEAN	1.13651	0.87989	0.02609	3.73	0.0002***
CENTRAL_ASIA	1.13274	0.88282	0.03430	4.91	<.0001***
EM_ASIA-PACIFIC	12.08139	0.08277	0.06429	2.82	0.0048***
EM_EUROPE	4.69028	0.21321	0.09869	6.95	<.0001***
HI_ASIA-PACIFIC	14.36062	0.06963	-0.14838	-5.97	<.0001***
HI_EUROPE	8.70568	0.11487	0.02504	1.29	0.1957
LATIN_AMERICA	2.58032	0.38755	0.13253	12.58	<.0001***
MIDDLE_EAST	2.61936	0.38177	0.08695	8.19	<.0001***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.07023	0.93438	-0.01405	-2.07	0.0384**
AGRICULTURE	1.05444	0.94837	-0.01692	-2.51	0.0120**
RESOURCES_CONSTRUCTION	1.15729	0.86409	-0.02163	-3.07	0.0022***
MANUFACTURING	1.37442	0.72758	-0.09262	-12.05	<.0001***
CREDINFO	1.75472	0.56989	-0.07197	-8.28	<.0001***
MINSH	1.91596	0.52193	0.04059	4.47	<.0001***
PROPERTY	3.83089	0.26104	0.04438	3.46	0.0005***
LRINDEX	1.53053	0.65337	0.03109	3.83	0.0001***
CONTRENF	3.78249	0.26438	-0.06880	-5.39	<.0001***
INSOLV	3.86696	0.25860	0.11579	8.98	<.0001***
logEBIT_TOAS	1.57708	0.63408	0.26757	32.49	<.0001***
logNWC_TOAS	1.20821	0.82767	-0.03478	-4.82	<.0001***
logMOVEABLE_TOAS	1.24734	0.80170	0.11326	15.46	<.0001***
logDEBT_EBITDA	2.36532	0.42278	0.74385	73.75	<.0001***
logIC	3.39325	0.29470	-0.00335	-0.28	0.7815

2. Step #2: All Independent Variables and Firm Size Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 2 model testing independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all independent variables and the two firm size dummy variables, and is represented by the following equation:

$$\begin{aligned} \log DEBT_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \\ & \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \\ & \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBTEBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \\ & \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \varepsilon_{i,x} \end{aligned} \quad (25)$$

The results are based on 13,698 observations. The F value is very high at 14,478.20, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9322, implying a high degree of explanatory power from the model.

There is no issue with biased estimates. However, regarding collinearity diagnostics, PROPERTY, CONTRENF and logIC show moderately high VIV at about 2.80. All independent variables are statistically significant.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the MEDIUM dummy results are not statistically significant. The model results are accepted, but with caution due to the collinearity issues described above.

Table 46: Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (25) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 \log EBIT_{i,x} + \beta_9 \log FINSLACK_{i,x} + \beta_{10} \log IMMOVEABLE_{i,x} + \beta_{11} \log MOVEABLE_{i,x} + \beta_{12} \log DEBTEBITDA_{i,x} + \beta_{13} \log IC_{i,x} + \beta_{14} SMALL_{i,x} + \beta_{15} MEDIUM_{i,x} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy, legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	14,478.20	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.17593	0.85039	-0.00740	-3.07	0.0022***
“MEDIUM”	1.14847	0.87073	-0.00295	-1.24	0.2159
CREDINFO	1.54955	0.64535	-0.00820	-2.96	0.0031***
MINSH	1.29799	0.77042	-0.02361	-9.31	<.0001***
PROPERTY	2.79453	0.35784	0.05229	14.05	<.0001***
LRINDEX	1.18427	0.84440	0.00650	2.68	0.0073***
CONTRENF	2.86160	0.34945	-0.06050	-16.07	<.0001***
INSOLV	1.68582	0.59318	0.02446	8.46	<.0001***
logEBIT_TOAS	1.45974	0.68505	0.37570	139.73	<.0001***
logNWC_TOAS	1.19205	0.83889	-0.02031	-8.36	<.0001***
logMOVEABLE_TOAS	1.08177	0.92441	0.08332	36.00	<.0001***
logDEBT_EBITDA	2.18345	0.45799	1.03183	313.77	<.0001***
logIC	2.82486	0.35400	-0.04111	-10.99	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 2 model testing independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all independent variables and the two firm size dummy variables, and is represented by the following equation:

$$\begin{aligned} \logLTD_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1CREDINFO_{i,x} + \beta_2MINSH_{i,x} + \beta_3REGEFF_{i,x} + \beta_4PROPERTY_{i,x} + \\ & \beta_5LRINDEX_{i,x} + \beta_6CONTRENF_{i,x} + \beta_7INSOLV_{i,x} + \beta_8\logEBIT_{i,x} + \beta_9\logFINSLACK_{i,x} + \\ & \beta_{10}\logIMMOVEABLE_{i,x} + \beta_{11}\logMOVEABLE_{i,x} + \beta_{12}\logDEBTBITDA_{i,x} + \beta_{13}\logIC_{i,x} + \\ & \beta_{14}SMALL_{i,x} + \beta_{15}MEDIUM_{i,x} + \varepsilon_{i,x} \end{aligned} \quad (26)$$

The results are based on 11,049 observations. The F value is high at 809.85, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also reasonably high at 0.4882, which means the model has some explanatory power.

There is no issue with biased estimates. However, MINSH and CONTRENF show moderately high VIV above 2.60, and logIC has an even higher VIV above 2.90. MINSH also lacks statistical significance. Therefore, there are problems with some of the legal and institutional variables and one of the financial variables in the model.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the SMALL firm size dummy results are not statistically significant. The model results are accepted, but with caution due to collinearity issues described above.

Table 47: Independent Variables and Firm Size Dummy ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (26) is $\logLTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1CREDINFO_{i,x} + \beta_2MINSH_{i,x} + \beta_3REGEFF_{i,x} + \beta_4PROPERTY_{i,x} + \beta_5LRINDEX_{i,x} + \beta_6CONTRENF_{i,x} + \beta_7INSOLV_{i,x} + \beta_8\logEBIT_{i,x} + \beta_9\logFINSACK_{i,x} + \beta_{10}\logIMMOVEABLE_{i,x} + \beta_{11}\logMOVEABLE_{i,x} + \beta_{12}\logDEBTEBITDA_{i,x} + \beta_{13}\logIC_{i,x} + \beta_{14}SMALL_{i,x} + \beta_{15}MEDIUM_{i,x} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy, legal and institutional variables and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	809.85	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.15390	0.86663	0.00469	0.64	0.5214
“MEDIUM”	1.08865	0.91857	-0.04309	-6.06	<.0001***
CREDINFO	1.51910	0.65829	-0.05765	-6.87	<.0001***
MINSH	1.29025	0.77505	-0.00605	-0.78	0.4343
PROPERTY	2.60652	0.38365	0.09978	9.08	<.0001***
LRINDEX	1.16978	0.85486	0.02550	3.46	0.0005***
CONTRENF	2.60922	0.38326	-0.11009	-10.01	<.0001***
INSOLV	1.66138	0.60191	0.13779	15.70	<.0001***
logEBIT_TOAS	1.49703	0.66799	0.31098	37.32	<.0001***
logNWC_TOAS	1.16805	0.85613	-0.06023	-8.18	<.0001***
logMOVEABLE_TOAS	1.08041	0.92558	0.07481	10.57	<.0001***
logDEBT_EBITDA	2.20268	0.45399	0.67939	67.22	<.0001***
logIC	2.90067	0.34475	-0.11477	-9.90	<.0001***

3. Step #3: All Legal and Institutional Variables and Dummy Variables

a) logDEBT/ASSETS as Dependent Variable

The Step 3 model testing independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all legal and institutional variables and all dummy variables, thereby including all independent variables except financial variables. This is represented by the following equation:

$$\begin{aligned} \logDEBT_{i,x}/TOAS_{i,x} = & \beta_0 + \beta_1CREDINFO_{i,x} + \beta_2MINSH_{i,x} + \beta_3REGEFF_{i,x} + \beta_4PROPERTY_{i,x} + \\ & \beta_5LRINDEX_{i,x} + \beta_6CONTRENF_{i,x} + \beta_7INSOLV_{i,x} + \beta_8SMALL_{i,x} + \beta_9MEDIUM_{i,x} + \beta_{10}INCOME_{i,x} + \\ & \beta_{11}REGION_{i,x1} + \beta_{12}REGION_{i,x2} + \beta_{13}REGION_{i,x3} + \beta_{14}REGION_{i,x4} + \beta_{15}REGION_{i,x5} + \\ & \beta_{16}REGION_{i,x6} + \beta_{17}REGION_{i,x7} + \beta_{18}REGION_{i,x8} + \beta_{19}REGION_{i,x9} + \beta_{20}REGION_{i,x10} + \\ & \beta_{21}LISTED_{i,x} + \beta_{22}SECTOR_{i,x1} + \beta_{23}SECTOR_{i,x2} + \beta_{24}SECTOR_{i,x3} + \varepsilon_{i,x} \end{aligned} \quad (27)$$

The results are based on 26,647 observations. The F value is low at 28.15, although results for the model are statistically significant. This suggests the model would not be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also a very low 0.027, implying the model has very limited explanatory power.

There are many problems with the model, starting with biased estimates for several of the variables (income level, most regions), high VIV and low Tolerance estimates for a majority of the dummy variables, and a lack of statistical significance for many other variables. Collinearity issues are problematic for

emerging markets, four of 10 regions, and three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV). Meanwhile, there are no results for South Asia, results for four of the 10 regions (Central Asia, EM-ASPAC, EM-EUR, Middle East) are not statistically significant and Latin America showed weak statistical significance. All sector results and results for two of six legal and institutional variables (CREDINFO, LRINDEX) also lacked statistical significance, while MINSH and CONTRENF showed weak statistical significance.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, model results are rejected due to the collinearity problems and other weaknesses described above.

Table 48: All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (27) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and legal and institutional variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	26,647	28.15	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.17477	0.85123	-0.04275	-6.51	<.0001***
“MEDIUM”	1.11811	0.89437	-0.05599	-8.74	<.0001***
EMERGING	21.24670	0.04707	-0.11568	-4.14	<.0001***
AFRICA	1.56854	0.63754	-0.04059	-5.35	<.0001***
CARIBBEAN	1.07911	0.92669	-0.01883	-2.99	0.0028***
CENTRAL_ASIA	1.19273	0.83841	-0.00243	-0.37	0.7135
EM_ASIA-PACIFIC	11.06843	0.09035	-0.02093	-1.04	0.2992
EM_EUROPE	4.42377	0.22605	-0.01254	-0.98	0.3252
HI_ASIA-PACIFIC	3.81361	0.26222	-0.15314	-12.94	<.0001***
HI_EUROPE	3.09639	0.32296	-0.05415	-5.08	<.0001***
LATIN_AMERICA	2.09608	0.47708	0.01716	1.96	0.0504*
MIDDLE_EAST	2.63097	0.38009	0.00784	0.80	0.4249
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06484	0.93911	-0.03782	-6.05	<.0001***
AGRICULTURE	1.04203	0.95967	0.00342	0.55	0.5801
RESOURCES_CONSTRUCTION	1.12331	0.89023	-0.00185	-0.29	0.7729
MANUFACTURING	1.17480	0.85121	-0.00975	-1.49	0.1375
CREDINFO	1.75092	0.57113	0.00106	0.13	0.8950
MINSH	1.70632	0.58606	0.01394	1.76	0.0782*
PROPERTY	3.74605	0.26695	-0.04956	-4.23	<.0001***
LRINDEX	1.96888	0.50790	-0.00093722	-0.11	0.9122
CONTRENF	3.53915	0.28255	0.02160	1.90	0.0580*
INSOLV	3.89070	0.25702	-0.04912	-4.11	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 3 model testing independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all legal and institutional variables and all dummy variables, thereby including all independent variables except financial variables. This is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 CREDINFO_{i,x} + \beta_2 MINSH_{i,x} + \beta_3 REGEFF_{i,x} + \beta_4 PROPERTY_{i,x} + \beta_5 LRINDEX_{i,x} + \beta_6 CONTRENF_{i,x} + \beta_7 INSOLV_{i,x} + \beta_8 SMALL_{i,x} + \beta_9 MEDIUM_{i,x} + \beta_{10} INCOME_{i,x} + \beta_{11} REGION_{i,x1} + \beta_{12} REGION_{i,x2} + \beta_{13} REGION_{i,x3} + \beta_{14} REGION_{i,x4} + \beta_{15} REGION_{i,x5} + \beta_{16} REGION_{i,x6} + \beta_{17} REGION_{i,x7} + \beta_{18} REGION_{i,x8} + \beta_{19} REGION_{i,x9} + \beta_{20} REGION_{i,x10} + \beta_{21} LISTED_{i,x} + \beta_{22} SECTOR_{i,x1} + \beta_{23} SECTOR_{i,x2} + \beta_{24} SECTOR_{i,x3} + \varepsilon_{i,x} \quad (28)$$

The results are based on 22,117 observations. The F value is moderate at 84.00, and results for the model are statistically significant. This suggests the model would be moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is low at 0.0772, implying the model has limited explanatory power.

There are many problems with the model, starting with biased estimates for several of the variables (income level, most regions), high VIF and low Tolerance estimates for many of the dummy variables, and a lack of statistical significance for other variables. Collinearity issues are problematic for emerging markets, four of 10 regions, and three of six legal and institutional variables (PROPERTY, CONTRENF, INSOLV). Meanwhile, there are no results for South Asia, results for Africa, the Caribbean, Central Asia and EM-Europe are not statistically significant, and results for two of six legal and institutional variables (MINSH, PROPERTY) also lack statistical significance.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, model results are rejected due to the collinearity problems and other weaknesses described above.

Table 49: All Legal and Institutional and Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (28) is $\logLTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1CREDINFO_{i,x} + \beta_2MINSH_{i,x} + \beta_3REGEFF_{i,x} + \beta_4PROPERTY_{i,x} + \beta_5LRINDEX_{i,x} + \beta_6CONTRENF_{i,x} + \beta_7INSOLV_{i,x} + \beta_8SMALL_{i,x} + \beta_9MEDIUM_{i,x} + \beta_{10}INCOME_{i,x} + \beta_{11}REGION_{i,x1} + \beta_{12}REGION_{i,x2} + \beta_{13}REGION_{i,x3} + \beta_{14}REGION_{i,x4} + \beta_{15}REGION_{i,x5} + \beta_{16}REGION_{i,x6} + \beta_{17}REGION_{i,x7} + \beta_{18}REGION_{i,x8} + \beta_{19}REGION_{i,x9} + \beta_{20}REGION_{i,x10} + \beta_{21}LISTED_{i,x} + \beta_{22}SECTOR_{i,x1} + \beta_{23}SECTOR_{i,x2} + \beta_{24}SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and legal and institutional variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	22,117	84.00	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.16134	0.86107	-0.03540	-5.08	<.0001***
“MEDIUM”	1.07857	0.92715	-0.07920	-11.80	<.0001***
EMERGING	20.86168	0.04793	-0.20096	-6.81	<.0001***
AFRICA	1.58136	0.63237	-0.00525	-0.65	0.5184
CARIBBEAN	1.07874	0.92701	-0.00087199	-0.13	0.8966
CENTRAL_ASIA	1.18623	0.84301	0.00674	0.96	0.3381
EM_ASIA-PACIFIC	9.75450	0.10252	-0.05675	-2.81	0.0049***
EM_EUROPE	4.28501	0.23337	-0.00371	-0.28	0.7815
HI_ASIA-PACIFIC	3.65956	0.27326	-0.28095	-22.72	<.0001***
HI_EUROPE	3.08755	0.32388	-0.06944	-6.12	<.0001***
LATIN_AMERICA	2.23428	0.44757	0.08036	8.32	<.0001***
MIDDLE_EAST	2.49027	0.40156	0.03101	3.04	0.0024***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06854	0.93585	-0.03166	-4.74	<.0001***
AGRICULTURE	1.04113	0.96049	-0.01573	-2.39	0.0171**
RESOURCES_CONSTRUCTION	1.11926	0.89344	-0.02243	-3.28	0.0010***
MANUFACTURING	1.16953	0.85504	-0.07761	-11.10	<.0001***
CREDINFO	1.75105	0.57108	-0.04982	-5.83	<.0001***
MINSH	1.69053	0.59153	0.00478	0.57	0.5695
PROPERTY	3.57013	0.28010	-0.00530	-0.43	0.6642
LRINDEX	1.94511	0.51411	0.02863	3.18	0.0015***
CONTRENF	3.34277	0.29915	0.02933	2.48	0.0131**
INSOLV	3.81703	0.26198	0.02652	2.10	0.0357**

4. Step #4: All Financial Independent Variables and Dummy Variables

a) logDEBT/ASSETS as Dependent Variable

The Step 4 model testing independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all financial variables and all dummy variables, thereby including all independent variables except legal and institutional variables. This is represented by the following equation:

$$\logDEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1\logEBIT_{i,x} + \beta_2\logFINSLACK_{i,x} + \beta_3\logIMMOVEABLE_{i,x} + \beta_4\logMOVEABLE_{i,x} + \beta_5\logDEBTBITDA_{i,x} + \beta_6\logIC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \beta_{10}REGION_{i,x1} + \beta_{11}REGION_{i,x2} + \beta_{12}REGION_{i,x3} + \beta_{13}REGION_{i,x4} + \quad (29)$$

$$\beta_{14}REGION_{i,x5} + \beta_{15}REGION_{i,x6} + \beta_{16}REGION_{i,x7} + \beta_{17}REGION_{i,x8} + \beta_{18}REGION_{i,x9} + \beta_{19}REGION_{i,x10} + \beta_{20}LISTED_{i,x} + \beta_{21}SECTOR_{i,x1} + \beta_{22}SECTOR_{i,x2} + \beta_{23}SECTOR_{i,x3} + \epsilon_{i,x}$$

The results are based on 13,698 observations. The F value is very high at 8,968.40, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9323, implying the model has substantial explanatory power.

Despite these strengths, there are several problems with the model, starting with biased estimates for the income level dummy and most regions. There are also unacceptably high VIV and low Tolerance estimates for the income level dummy and three of the regional dummy variables. Two regions (Caribbean, Latin America) lack statistical significance, while EM-ASPAC shows weak statistical significance. Meanwhile, there are no results for South Asia. One of the financial variables (logIC) also lacks statistical significance.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, model results are rejected due to the collinearity problems and other weaknesses described above.

Table 50: All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (29) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \beta_{10} REGION_{i,x1} + \beta_{11} REGION_{i,x2} + \beta_{12} REGION_{i,x3} + \beta_{13} REGION_{i,x4} + \beta_{14} REGION_{i,x5} + \beta_{15} REGION_{i,x6} + \beta_{16} REGION_{i,x7} + \beta_{17} REGION_{i,x8} + \beta_{18} REGION_{i,x9} + \beta_{19} REGION_{i,x10} + \beta_{20} LISTED_{i,x} + \beta_{21} SECTOR_{i,x1} + \beta_{22} SECTOR_{i,x2} + \beta_{23} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	8,968.40	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.16609	0.85757	-0.00900	-3.74	0.0002***
“MEDIUM”	1.15057	0.86913	-0.00700	-2.94	0.0033***
EMERGING	18.02366	0.05548	-0.08191	-8.67	<.0001***
AFRICA	1.31586	0.75996	0.00939	3.68	0.0002***
CARIBBEAN	1.04065	0.96094	0.00269	1.19	0.2359
CENTRAL_ASIA	1.03304	0.96802	0.00934	4.13	<.0001***
EM_ASIA-PACIFIC	4.11797	0.24284	0.00820	1.82	0.0694*
EM_EUROPE	1.73963	0.57483	0.02768	9.43	<.0001***
HI_ASIA-PACIFIC	12.55595	0.07964	-0.07628	-9.68	<.0001***
HI_EUROPE	7.70955	0.12971	-0.01672	-2.71	0.0068***
LATIN_AMERICA	1.56603	0.63856	0.00167	0.60	0.5490
MIDDLE_EAST	1.55698	0.64227	0.01104	3.98	<.0001***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.05669	0.94635	-0.00676	-2.95	0.0031***
AGRICULTURE	1.05216	0.95043	-0.00898	-3.94	<.0001***
RESOURCES_CONSTRUCTION	1.14985	0.86968	-0.01293	-5.42	<.0001***
MANUFACTURING	1.35008	0.74070	-0.01977	-7.65	<.0001***
logEBIT_TOAS	1.46617	0.68205	0.36349	134.92	<.0001***
logNWC_TOAS	1.22602	0.81565	-0.01777	-7.21	<.0001***
logMOVEABLE_TOAS	1.24931	0.80044	0.08891	35.75	<.0001***
logDEBT_EBITDA	2.20207	0.45412	1.05077	318.26	<.0001***
logIC	2.85237	0.35059	-0.00705	-1.88	0.0606*

b) logLTD/ASSETS as Dependent Variable

The Step 4 model testing independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all financial variables and all dummy variables, thereby including all independent variables except legal and institutional variables. This is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \beta_{10} REGION_{i,x1} + \beta_{11} REGION_{i,x2} + \beta_{12} REGION_{i,x3} + \beta_{13} REGION_{i,x4} + \beta_{14} REGION_{i,x5} + \beta_{15} REGION_{i,x6} + \beta_{16} REGION_{i,x7} + \beta_{17} REGION_{i,x8} + \beta_{18} REGION_{i,x9} + \beta_{19} REGION_{i,x10} + \beta_{20} LISTED_{i,x} + \beta_{21} SECTOR_{i,x1} + \beta_{22} SECTOR_{i,x2} + \beta_{23} SECTOR_{i,x3} + \epsilon_{i,x} \quad (30)$$

The results are based on 11,049 observations. The F value is high at 557.23, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.5148, implying the model has explanatory power.

However, there are several problems with the model, starting with biased estimates for several of the variables (income level, most regions), and high VIV and low Tolerance estimates for the income level dummy, three of the regional dummy variables, and the logIC financial variable. HI-EUR also lacks statistical significance while EM-ASPAC shows limited statistical significance. There are no results for South Asia.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the SMALL firm size dummy is not statistically significant. However, model results are rejected due to the collinearity problems and other weaknesses described above.

Table 51: All Financial Independent and Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (30) is $\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \beta_{10} REGION_{i,x1} + \beta_{11} REGION_{i,x2} + \beta_{12} REGION_{i,x3} + \beta_{13} REGION_{i,x4} + \beta_{14} REGION_{i,x5} + \beta_{15} REGION_{i,x6} + \beta_{16} REGION_{i,x7} + \beta_{17} REGION_{i,x8} + \beta_{18} REGION_{i,x9} + \beta_{19} REGION_{i,x10} + \beta_{20} LISTED_{i,x} + \beta_{21} SECTOR_{i,x1} + \beta_{22} SECTOR_{i,x2} + \beta_{23} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, regional dummies, listed status dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	557.23	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.16039	0.86178	0.00422	0.59	0.5551
“MEDIUM”	1.10885	0.90183	-0.04574	-6.55	<.0001***
EMERGING	16.32155	0.06127	-0.31853	-11.89	<.0001***
AFRICA	1.30726	0.76496	0.03366	4.44	<.0001***
CARIBBEAN	1.04539	0.95659	0.02739	4.04	<.0001***
CENTRAL_ASIA	1.03553	0.96569	0.03114	4.61	<.0001***
EM_ASIA-PACIFIC	3.81151	0.26236	0.02166	1.67	0.0944*
EM_EUROPE	1.76377	0.56697	0.09841	11.17	<.0001***
HI_ASIA-PACIFIC	11.53983	0.08666	-0.20137	-8.94	<.0001***
HI_EUROPE	7.45661	0.13411	-0.02193	-1.21	0.2260
LATIN_AMERICA	1.64213	0.60897	0.10098	11.88	<.0001***
MIDDLE_EAST	1.53693	0.65065	0.04944	6.01	<.0001***
SOUTH_ASIA	.	.	.	.	.
LISTED	1.06441	0.93948	-0.01630	-2.38	0.0172**
AGRICULTURE	1.05098	0.95150	-0.02062	-3.03	0.0024***
RESOURCES_CONSTRUCTION	1.15230	0.86783	-0.02145	-3.01	0.0026***
MANUFACTURING	1.35200	0.73965	-0.09880	-12.81	<.0001***
logEBIT_TOAS	1.51533	0.65992	0.25128	30.77	<.0001***
logNWC_TOAS	1.20410	0.83050	-0.03550	-4.88	<.0001***
logMOVEABLE_TOAS	1.24450	0.80353	0.11108	15.01	<.0001***
logDEBT_EBITDA	2.23667	0.44709	0.75877	76.49	<.0001***
logIC	2.98069	0.33549	0.03370	2.94	0.0033***

5. Step #5: All Financial Variables and Firm Size Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 5 model testing financial independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is represented by the following equation:

$$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \epsilon_{i,x} \quad (31)$$

The results are based on 13,697 observations. The F value is very high at 25,845.70, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9297, implying the

model has explanatory power. The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 52: All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (31) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTEBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \epsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	25,845.7	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.06294	0.94079	-0.00867	-3.71	0.0002***
“MEDIUM”	1.05491	0.94795	-0.00775	-3.33	0.0009***
logEBIT_TOAS	1.33790	0.74744	0.36981	141.04	<.0001***
logNWC_TOAS	1.17995	0.84749	-0.02439	-9.90	<.0001***
logMOVEABLE_TOAS	1.07556	0.92975	0.08239	35.05	<.0001***
logDEBT_EBITDA	1.99874	0.50031	1.03670	323.49	<.0001***
logIC	2.19279	0.45604	-0.02666	-7.94	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 5 model testing financial independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTEBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \epsilon_{i,x} \quad (32)$$

The results are based on 11,049 observations. The F value is high at 1,371.47, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is low at 0.4651, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All results for financial variables are statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results show the SMALL firm size dummy has limited statistical significance.

Table 53: All Financial Variables and Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (32) is $\logLTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1\logEBIT_{i,x} + \beta_2\logFINS\text{LACK}_{i,x} + \beta_3\logIM\text{MOVEABLE}_{i,x} + \beta_4\logMOVEABLE_{i,x} + \beta_5\logDEBT\text{EBITDA}_{i,x} + \beta_6\logIC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \epsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	1,371.47	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.05273	0.94992	-0.01358	-1.90	0.0572*
“MEDIUM”	1.04451	0.95739	-0.06615	-9.30	<.0001***
logEBIT_TOAS	1.36021	0.73518	0.27020	33.28	<.0001***
logNWC_TOAS	1.16005	0.86203	-0.06715	-8.96	<.0001***
logMOVEABLE_TOAS	1.07535	0.92993	0.06803	9.43	<.0001***
logDEBT_EBITDA	2.02069	0.49488	0.71056	71.82	<.0001***
logIC	2.19584	0.45541	-0.02498	-2.42	0.0155**

6. Step #6: All Financial Variables and Firm Size Dummies with Income Level Dummy

a) logDEBT/ASSETS as Dependent Variable

The Step 6 model testing financial independent variables and firm size and income level dummies in relation to logDEBT/ASSETS as the dependent variable is represented by the following equation:

$$\logDEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1\logEBIT_{i,x} + \beta_2\logFINS\text{LACK}_{i,x} + \beta_3\logIM\text{MOVEABLE}_{i,x} + \beta_4\logMOVEABLE_{i,x} + \beta_5\logDEBT\text{EBITDA}_{i,x} + \beta_6\logIC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x} \quad (33)$$

The results are based on 13,698 observations. The F value is very high at 22,640.40, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9297, implying the model has considerable explanatory power.

The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All results are statistically significant for financial variables and the income level dummy.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 54: Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (33) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT_EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	22,640.40	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.09921	0.90974	-0.00698	-2.94	0.0033***
“MEDIUM”	1.11477	0.89704	-0.00559	-2.34	0.0195**
EMERGING	1.20039	0.83306	-0.00968	-3.90	<.0001***
logEBIT_TOAS	1.36709	0.73148	0.37132	140.17	<.0001***
logNWC_TOAS	1.18365	0.84484	-0.02385	-9.68	<.0001***
logMOVEABLE_TOAS	1.08006	0.92587	0.08299	35.24	<.0001***
logDEBT_EBITDA	2.02597	0.49359	1.03524	321.02	<.0001***
logIC	2.34282	0.42684	-0.03008	-8.67	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 6 model testing financial independent variables and firm size and income level dummies in relation to logLTD/ASSETS as the dependent variable is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT_EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x} \quad (34)$$

The results are based on 11,049 observations. The F value is high at 1,256.96, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.4767, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All financial variables are statistically significant as is the income level dummy.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results show the SMALL firm size dummy is not statistically significant.

Table 55: Financial Variables and Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (34) $\logLTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \logEBIT_{i,x} + \beta_2 \logFINSACK_{i,x} + \beta_3 \logIMMOVEABLE_{i,x} + \beta_4 \logMOVEABLE_{i,x} + \beta_5 \logDEBTBITDA_{i,x} + \beta_6 \logIC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	1,256.96	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.08690	0.92004	0.00630	0.88	0.3802
“MEDIUM”	1.08465	0.92195	-0.04461	-6.22	<.0001***
EMERGING	1.20872	0.82732	-0.11825	-15.62	<.0001***
logEBIT_TOAS	1.39514	0.71678	0.29030	35.70	<.0001***
logNWC_TOAS	1.16200	0.86059	-0.06240	-8.41	<.0001***
logMOVEABLE_TOAS	1.07962	0.92625	0.07506	10.49	<.0001***
logDEBT_EBITDA	2.04600	0.48876	0.69345	70.41	<.0001***
logIC	2.38985	0.41844	-0.07235	-6.80	<.0001***

7. Step #7: All Financial Variables and Firm Size Dummies with Regional Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 7 model testing independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all financial variables, the two firm size dummy variables and all regional dummy variables. This is represented by the following equation:

$$\logDEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \logEBIT_{i,x} + \beta_2 \logFINSACK_{i,x} + \beta_3 \logIMMOVEABLE_{i,x} + \beta_4 \logMOVEABLE_{i,x} + \beta_5 \logDEBTBITDA_{i,x} + \beta_6 \logIC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 REGION_{i,x1} + \beta_{10} REGION_{i,x2} + \beta_{11} REGION_{i,x3} + \beta_{12} REGION_{i,x4} + \beta_{13} REGION_{i,x5} + \beta_{14} REGION_{i,x6} + \beta_{15} REGION_{i,x7} + \beta_{16} REGION_{i,x8} + \beta_{17} REGION_{i,x9} + \beta_{18} REGION_{i,x10} + \varepsilon_{i,x} \quad (35)$$

The results are based on 13,698 observations. The F value is very high at 11,010.60, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9319, implying the model has explanatory power.

Despite these strengths, there are several problems with the model. Seven (all four Europe and Asia-Pacific regions combined with Latin America, Middle East and South Asia) of the 10 regions show high VIV and low Tolerance estimates. Meanwhile, results for Central Asia are not statistically significant.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, model results are rejected due to the collinearity problems and other weaknesses described above.

Table 56: Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (35) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 REGION_{i,x1} + \beta_{10} REGION_{i,x2} + \beta_{11} REGION_{i,x3} + \beta_{12} REGION_{i,x4} + \beta_{13} REGION_{i,x5} + \beta_{14} REGION_{i,x6} + \beta_{15} REGION_{i,x7} + \beta_{16} REGION_{i,x8} + \beta_{17} REGION_{i,x9} + \beta_{18} REGION_{i,x10} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, regional dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	11,010.60	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.16127	0.86113	-0.00793	-3.30	0.0010***
“MEDIUM”	1.14372	0.87434	-0.00571	-2.39	0.0167**
AFRICA	2.52295	0.39636	-0.01661	-4.69	<.0001***
CARIBBEAN	1.19984	0.83345	-0.00629	-2.57	0.0101**
CENTRAL_ASIA	1.15250	0.86768	0.00099019	0.41	0.6793
EM_ASIA-PACIFIC	15.23651	0.06563	-0.07270	-8.35	<.0001***
EM_EUROPE	4.58144	0.21827	-0.01240	-2.60	0.0094***
HI_ASIA-PACIFIC	12.38180	0.08076	-0.07645	-9.74	<.0001***
HI_EUROPE	7.61022	0.13140	-0.01574	-2.56	0.0106**
LATIN_AMERICA	3.33349	0.29999	-0.02936	-7.21	<.0001***
MIDDLE_EAST	3.60570	0.27734	-0.02386	-5.63	<.0001***
SOUTH_ASIA	5.36607	0.18636	-0.04537	-8.78	<.0001***
logEBIT_TOAS	1.46482	0.68268	0.36412	134.83	<.0001***
logNWC_TOAS	1.19218	0.83880	-0.02089	-8.58	<.0001***
logMOVEABLE_TOAS	1.09442	0.91372	0.08244	35.32	<.0001***
logDEBT_EBITDA	2.19428	0.45573	1.05010	317.71	<.0001***
logIC	2.84150	0.35193	-0.00739	-1.97	0.0493**

b) logLTD/ASSETS as Dependent Variable

The Step 7 model testing independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all financial variables, the two firm size dummy variables and all regional dummy variables. This is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 REGION_{i,x1} + \beta_{10} REGION_{i,x2} + \beta_{11} REGION_{i,x3} + \beta_{12} REGION_{i,x4} + \beta_{13} REGION_{i,x5} + \beta_{14} REGION_{i,x6} + \beta_{15} REGION_{i,x7} + \beta_{16} REGION_{i,x8} + \beta_{17} REGION_{i,x9} + \beta_{18} REGION_{i,x10} + \varepsilon_{i,x} \quad (36)$$

The results are based on 11,049 observations. The F value is high at 667.99, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.5073, implying the model has explanatory power.

Despite these strengths, there are several problems with the model. Seven (all four Europe and Asia-Pacific regions combined with Latin America, Middle East and South Asia) of the 10 regions show high VIV

and low Tolerance estimates. Meanwhile, results for the Caribbean, Central Asia and high-income Europe are not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results also show the SMALL firm size dummy is not statistically significant. However, model results are rejected due to the collinearity problems and other weaknesses described above.

Table 57: Financial Variables and Firm Size and Regional Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (36) is $\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 REGION_{i,x1} + \beta_{10} REGION_{i,x2} + \beta_{11} REGION_{i,x3} + \beta_{12} REGION_{i,x4} + \beta_{13} REGION_{i,x5} + \beta_{14} REGION_{i,x6} + \beta_{15} REGION_{i,x7} + \beta_{16} REGION_{i,x8} + \beta_{17} REGION_{i,x9} + \beta_{18} REGION_{i,x10} + \epsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, regional dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	667.99	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.15563	0.86533	0.01017	1.41	0.1571
“MEDIUM”	1.10223	0.90725	-0.04137	-5.90	<.0001***
AFRICA	2.25837	0.44280	-0.06687	-6.66	<.0001***
CARIBBEAN	1.19198	0.83894	-0.01032	-1.41	0.1575
CENTRAL_ASIA	1.14104	0.87639	-0.00308	-0.43	0.6665
EM_ASIA-PACIFIC	12.00464	0.08330	-0.28368	-12.25	<.0001***
EM_EUROPE	4.15204	0.24085	-0.06169	-4.53	<.0001***
HI_ASIA-PACIFIC	11.37293	0.08793	-0.21268	-9.44	<.0001***
HI_EUROPE	7.35400	0.13598	-0.02656	-1.47	0.1428
LATIN_AMERICA	3.29024	0.30393	-0.03140	-2.59	0.0096***
MIDDLE_EAST	3.12856	0.31964	-0.08597	-7.27	<.0001***
SOUTH_ASIA	4.78214	0.20911	-0.18417	-12.60	<.0001***
logEBIT_TOAS	1.51367	0.66064	0.25478	30.98	<.0001***
logNWC_TOAS	1.16731	0.85667	-0.05208	-7.21	<.0001***
logMOVEABLE_TOAS	1.09362	0.91439	0.07750	11.09	<.0001***
logDEBT_EBITDA	2.22453	0.44953	0.75077	75.31	<.0001***
logIC	2.96600	0.33715	0.02664	2.31	0.0207**

8. Step #8: All Financial Variables and Firm Size Dummies with Listed Status Dummy

a) logDEBT/ASSETS as Dependent Variable

The Step 8 model testing financial independent variables and firm size and listed status dummies in relation to logDEBT/ASSETS as the dependent variable is represented by the following equation:

$$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 LISTED_{i,x} + \epsilon_{i,x} \quad (37)$$

The results are based on 13,698 observations. The F value is high at 22,631.00, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9297, implying the model has explanatory power.

The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All results are statistically significant.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 58: Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (37) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTEBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 LISTED_{i,x} + \epsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. "SMALL" and "MEDIUM" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, listed status dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	22,631.00	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.06295	0.94078	-0.00869	-3.72	0.0002***
"MEDIUM"	1.05491	0.94795	-0.00775	-3.33	0.0009***
LISTED	1.00614	0.99389	-0.00716	-3.15	0.0016***
logEBIT_TOAS	1.33916	0.74674	0.36956	140.93	<.0001***
logNWC_TOAS	1.18062	0.84702	-0.02420	-9.83	<.0001***
logMOVEABLE_TOAS	1.07700	0.92851	0.08266	35.15	<.0001***
logDEBT_EBITDA	1.99878	0.50030	1.03675	323.60	<.0001***
logIC	2.19865	0.45482	-0.02611	-7.77	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 8 model testing financial independent variables and firm size and listed status dummies in relation to logLTD/ASSETS as the dependent variable is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTEBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 LISTED_{i,x} + \epsilon_{i,x} \quad (38)$$

The results are based on 11,049 observations. The F value is moderately high at 1,205.79, and results for the model are statistically significant. This suggests the model would be moderately helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.4663, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All results for the financial variables and listed status dummy are statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model shows the SMALL firm size dummy has limited statistical significance.

Table 59: Financial Variables and Firm Size and Listed Status Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (38) is $\logLTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1\logEBIT_{i,x} + \beta_2\logFINSLACK_{i,x} + \beta_3\logIMMOVEABLE_{i,x} + \beta_4\logMOVEABLE_{i,x} + \beta_5\logDEBTBITDA_{i,x} + \beta_6\logIC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9LISTED_{i,x} + \epsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, listed status dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	1,205.79	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.05273	0.94991	-0.01366	-1.91	0.0555*
“MEDIUM”	1.04494	0.95699	-0.06688	-9.41	<.0001***
LISTED	1.00820	0.99187	-0.03496	-5.01	<.0001***
logEBIT_TOAS	1.36264	0.73387	0.26848	33.08	<.0001***
logNWC_TOAS	1.16058	0.86164	-0.06635	-8.86	<.0001***
logMOVEABLE_TOAS	1.07708	0.92843	0.06948	9.63	<.0001***
logDEBT_EBITDA	2.02082	0.49485	0.71094	71.93	<.0001***
logIC	2.20437	0.45364	-0.02176	-2.11	0.0350**

9. Step #9: All Financial Variables and Firm Size Dummies with Sector Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 9 model testing independent variables and firm size and sector dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$\logDEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1\logEBIT_{i,x} + \beta_2\logFINSLACK_{i,x} + \beta_3\logIMMOVEABLE_{i,x} + \beta_4\logMOVEABLE_{i,x} + \beta_5\logDEBTBITDA_{i,x} + \beta_6\logIC_{i,x} + \beta_7SMALL_{i,x} + \beta_8MEDIUM_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x} \quad (39)$$

The results are based on 13,698 observations. The F value is high at 18,211.20, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9301, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. Results for all three sectors and financial variables are statistically significant.

The model suggests the SMALL variable has a greater effect than the MEDIUM variable on the dependent variable compared to LARGE. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 60: Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (39) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	18,211.20	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.06722	0.93702	-0.00982	-4.21	<.0001***
“MEDIUM”	1.06266	0.94104	-0.00910	-3.91	<.0001***
AGRICULTURE	1.04917	0.95313	-0.00963	-4.16	<.0001***
RESOURCES_CONSTRUCTION	1.13649	0.87990	-0.01169	-4.85	<.0001***
MANUFACTURING	1.33612	0.74844	-0.02291	-8.77	<.0001***
logEBIT_TOAS	1.34000	0.74627	0.36893	141.03	<.0001***
logNWC_TOAS	1.21476	0.82321	-0.02079	-8.35	<.0001***
logMOVEABLE_TOAS	1.22804	0.81431	0.08985	35.88	<.0001***
logDEBT_EBITDA	2.00977	0.49757	1.03814	324.03	<.0001***
logIC	2.21090	0.45230	-0.02547	-7.58	<.0001***

b) *logLTD/ASSETS as Dependent Variable*

The Step 9 model testing independent variables and firm size and sector dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x} \quad (40)$$

The results are based on 11,049 observations. The F value is high at 997.56, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.4747, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. However, the results for logIC are not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the SMALL variable on the dependent variable compared to LARGE. This is consistent with the core premise of the research that there is a

positive correlation between firm size and credit access. Results for both firm size dummies are statistically significant.

Table 61: Financial Variables and Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (40) is $\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “MEDIUM” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	997.56	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.05654	0.94649	-0.01939	-2.73	0.0063***
“MEDIUM”	1.05106	0.95142	-0.07097	-10.03	<.0001***
AGRICULTURE	1.04805	0.95415	-0.02223	-3.15	0.0017***
RESOURCES_CONSTRUCTION	1.13793	0.87879	-0.01840	-2.50	0.0124**
MANUFACTURING	1.33593	0.74854	-0.11180	-14.02	<.0001***
logEBIT_TOAS	1.36288	0.73374	0.26555	32.97	<.0001***
logNWC_TOAS	1.19734	0.83518	-0.04835	-6.41	<.0001***
logMOVEABLE_TOAS	1.22482	0.81645	0.10594	13.88	<.0001***
logDEBT_EBITDA	2.03775	0.49074	0.72253	73.37	<.0001***
logIC	2.21984	0.45048	-0.01301	-1.27	0.2055

C. Main Observations

The log transformation results do not confirm the underlying premise of the research, that there is a positive correlation between firm size and credit access. The confirmation or rejection of the premise is balanced, with five “Yes” and five “No” when accounting for results from all models that can be accepted, including with caution. These results are little different from those reported in baseline regression results (Section 4). Moreover, the balanced results apply to full model results (one “Yes” and one “No”) as well as to model results focused on financial variables and dummy variables on the right-hand side of equations (four “Yes” and four “No”). Results without financial independent variables on the right-hand side of equations were rejected due to problems of collinearity and other weaknesses.

Beyond the results, the sample size is much smaller. The number of observations is typically 13,698 for logDEBT/ASSETS as the dependent variable and 11,049 at logLTD/ASSETS as the dependent variable. This compares with 21,500 and 18,019, respectively, for DEBT/ASSETS and LTD/ASSETS as dependent variables in the baseline regressions. Therefore, the log transformation has the effect of reducing the number of observations by about 8,000 for DEBT and 7,000 for LTD relationships. This helps to eliminate skewness, but adds the weakness of missing observations.

VI. Statistical Tests and Results—Large-Scale Firm Size Dummy Effects on Credit Access

A. General Approach

The regressions for large-scale firm size dummy effects replicate the baseline linear regression tests as reported in Section 4, and the log transformation regression tests as reported in Section 5. They simply replace LARGE for MEDIUM or SMALL to compare coefficients of credit access by firm size based on the revenue quantile definitions used in this research to test for firm size effect. However, due to the problems of the model identified in Sections 4 and 5, this section streamlines the approach and restricts the testing to 12 equations for each sample (baseline and log transformed) that account for firm size effects as well as the interactive effects of income level and sector. The operative equations for each of the steps for the baseline regression results are presented in Table 62 below. (Equations that apply to the log transformation robustness tests are presented in Table 75.)

Table 62: Overview of Baseline Regression Equations for Large-Scale Firm Size Effect

This table provides all the equations used in the baseline regressions for large-scale firm size effects. Panel (1) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and SMALL and LARGE firm size dummy variables on the right-hand side. Panel (2) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and MEDIUM and LARGE firm size dummy variables on the right-hand side. Panel (3) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and SMALL and LARGE firm size dummy variables and income dummy on the right-hand side. Panel (4) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and MEDIUM and LARGE firm size dummy variables and income dummy on the right-hand side. Panel (5) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and SMALL and LARGE firm size dummy variables and sector dummies on the right-hand side. Panel (6) provides the equations for DEBT/TOAS and LTD/TOAS as dependent variables on the left-hand side and all financial independent variables and MEDIUM and LARGE firm size dummy variables and sector dummies on the right-hand side. Step number corresponds to the step number for the testing. Equation number applies to econometric specifications for each test.

tep No.	Equation	Equation No.
1	Panel 1: All Financial Independent Variables and Small-Large Firm Size Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \epsilon_{i,x}$	(41)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \epsilon_{i,x}$	(42)
2	Panel 2: All Financial Independent Variables and Medium-Large Firm Size Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \epsilon_{i,x}$	(43)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \epsilon_{i,x}$	(44)
3	Panel 3: All Financial Independent Variables and Small-Large Firm Size and Income Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x}$	(45)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x}$	(46)
4	Panel 4: All Financial Independent Variables and Medium-Large Firm Size and Income Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x}$	(47)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x}$	(48)
5	Panel 5: All Financial Independent Variables and Small-Large Firm Size and Sector Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x}$	(49)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x}$	(50)
6	Panel 6: All Financial Independent Variables and Medium-Large Firm Size and Sector Dummies	
	$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x}$	(51)
	$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x}$	(52)

B. Baseline Regression Results for Large-Scale Firm Size Dummy Effects

1. Step #1: All Financial Independent Variables and Small-Large Firm Size Dummy Variables

a) DEBT/ASSETS as Dependent Variable

The Step 1 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial independent variables and SMALL and LARGE firm size dummy variables, and is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x} \quad (41)$$

The results are based on 21,500 observations. The F value is high at 2,806.38, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4775, implying that the model has explanatory power. All VIV and Tolerance estimates are satisfactory and statistically significant.

The model suggests the SMALL variable has a greater effect than the LARGE variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Model results show the LARGE firm size dummy is not statistically significant.

Table 63: Financial Independent Variables and Small-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Small-Large firm size dummy variable selection. The operative equation (41) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. "SMALL" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	2,806.38	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.21601	0.82236	0.01063	1.96	0.0506*
"LARGE"	1.21658	0.82197	0.00505	0.93	0.3534
EBIT_TOAS	1.32775	0.75316	0.16583	29.19	<.0001***
NWC_TOAS	1.35898	0.73585	-0.73572	-128.00	<.0001***
MOVEABLE_TOAS	1.03249	0.96853	0.02020	4.03	<.0001***
DEBT_EBITDA	1.00015	0.99985	0.04709	9.55	<.0001***
IC	1.03092	0.97001	-0.08239	-16.46	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 1 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial independent variables and SMALL and LARGE firm size dummy variables, and is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBT/EBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x} \quad (42)$$

The results are based on 18,019 observations. The F value is moderately high at 214.31, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.0769, implying that the model has limited explanatory power.

All VIV and Tolerance estimates are satisfactory. All results are statistically significant except for EBIT/ASSETS.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 64: Financial Independent Variables and Small-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Small-Large firm size dummy variable selection. The operative equation (42) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBT/EBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. "SMALL" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	214.31	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.24985	0.80009	0.03335	4.17	<.0001***
“LARGE”	1.25119	0.79924	0.05052	6.31	<.0001***
EBIT_TOAS	1.08601	0.92081	-0.00515	-0.69	0.4898
NWC_TOAS	1.12232	0.89101	-0.15807	-20.84	<.0001***
MOVEABLE_TOAS	1.04361	0.95821	0.13091	17.90	<.0001***
DEBT_EBITDA	1.00021	0.99979	0.08066	11.27	<.0001***
IC	1.04783	0.95436	-0.09758	-13.31	<.0001***

2. Step #2: All Financial Independent Variables and Medium-Large Firm Size Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 2 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial independent variables and MEDIUM and LARGE firm size dummy variables. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x} \quad (43)$$

The results are based on 21,500 observations. The F value is high at 2,458.40, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4778, implying that the model has explanatory power.

All VIV and Tolerance estimates are satisfactory except for the two firm size dummies which have VIV above 3.00 and Tolerance estimates below 0.33. All results are statistically significant.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, the results are rejected due to the poor collinearity diagnostics of the firm size dummies.

Table 65: Financial Independent Variables and Medium-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Medium-Large firm size dummy variable selection. The operative equation (43) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. "MEDIUM" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	2,458.40	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"MEDIUM"	3.04437	0.32847	-0.02075	-2.41	0.0159**
"LARGE"	3.16040	0.31642	-0.02046	-2.34	0.0195**
EBIT_TOAS	1.08663	0.92027	-0.01709	-3.33	0.0009***
NWC_TOAS	1.33181	0.75086	0.16689	29.34	<.0001***
MOVEABLE_TOAS	1.35900	0.73584	-0.73583	-128.06	<.0001***
DEBT_EBITDA	1.04554	0.95644	0.02206	4.38	<.0001***
IC	1.00016	0.99984	0.04715	9.57	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 2 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial independent variables and MEDIUM and LARGE firm size dummy variables. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x} \quad (44)$$

The results are based on 18,019 observations. The F value is moderately high at 214.71, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between

groups compared to variances within those groups. However, the R-square is 0.0770, implying that the model has limited explanatory power.

All VIV and Tolerance estimates are satisfactory except for the two firm size dummies which are at the 3.00 level for VIV and about 0.33 for Tolerance estimates. All results for financial variables are statistically significant except for EBIT/ASSETS.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research regarding firm size and credit access. The model shows the LARGE firm size dummy is not statistically significant. However, the results are rejected due to the poor collinearity diagnostics of the firm size dummies.

Table 66: Financial Independent Variables and Medium-Large Firm Size Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Medium-Large firm size dummy variable selection. The operative equation (44) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \epsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. "MEDIUM" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	214.71	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"MEDIUM"	2.99266	0.33415	-0.05534	-4.47	<.0001***
"LARGE"	3.02794	0.33026	-0.00921	-0.74	0.4596
EBIT_TOAS	1.08624	0.92060	-0.00497	-0.67	0.5052
NWC_TOAS	1.12229	0.89104	-0.15793	-20.83	<.0001***
MOVEABLE_TOAS	1.04361	0.95821	0.13092	17.90	<.0001***
DEBT_EBITDA	1.00021	0.99979	0.08067	11.27	<.0001***
IC	1.04783	0.95435	-0.09753	-13.31	<.0001***

3. Step #3: All Financial Independent Variables and Small-Large Firm Size and Income Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 3 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial independent variables, SMALL and LARGE firm size dummy variables, and the INCOME level dummy variable. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x} \quad (45)$$

The results are based on 21,500 observations. The F value is high at 2,458.09, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups

compared to variances within those groups. The R-square is also 0.4778, implying that the model has explanatory power.

All VIV and Tolerance estimates are satisfactory. All results for financial variables are statistically significant.

The model suggests the SMALL variable has a greater effect than the LARGE variable on the dependent variable compared to MEDIUM. This is inconsistent with the core premise of the research regarding firm size and credit access. The model results show the LARGE firm size dummy is not statistically significant.

Table 67: Financial Independent Variables and Small-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Small-Large firm size dummy variable selection. The operative equation (45) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. "SMALL" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	2,458.09	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.21950	0.82001	0.01159	2.13	0.0332**
"LARGE"	1.26930	0.78784	0.00130	0.23	0.8146
EMERGING	1.08654	0.92035	-0.01700	-3.31	0.0009***
EBIT_TOAS	1.33182	0.75085	0.16687	29.33	<.0001***
NWC_TOAS	1.35916	0.73575	-0.73594	-128.06	<.0001***
MOVEABLE_TOAS	1.04554	0.95644	0.02206	4.38	<.0001***
DEBT_EBITDA	1.00016	0.99984	0.04715	9.56	<.0001***
IC	1.03401	0.96710	-0.08330	-16.62	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 3 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial independent variables, SMALL and LARGE firm size dummy variables, and the INCOME level dummy variable. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \epsilon_{i,x} \quad (46)$$

The results are based on 18,019 observations. The F value is moderately high at 197.40, and results for the model are statistically significant. This suggests the model is moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.0806, implying that the model has limited explanatory power.

All VIV and Tolerance estimates are satisfactory. All results for financial variables are statistically significant except for EBIT/ASSETS.

The model suggests the SMALL variable has a greater effect than the LARGE variable on the dependent variable compared to MEDIUM. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 68: Financial Independent Variables and Small-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Small-Large firm size dummy variable selection. The operative equation (46) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	197.40	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.25590	0.79624	0.03810	4.76	<.0001***
“LARGE”	1.29320	0.77328	0.03801	4.68	<.0001***
EMERGING	1.09764	0.91105	-0.06396	-8.55	<.0001***
EBIT_TOAS	1.09510	0.91315	0.00067099	0.09	0.9285
NWC_TOAS	1.12253	0.89084	-0.15895	-21.00	<.0001***
MOVEABLE_TOAS	1.06106	0.94245	0.13898	18.88	<.0001***
DEBT_EBITDA	1.00024	0.99976	0.08099	11.33	<.0001***
IC	1.05784	0.94532	-0.10368	-14.11	<.0001***

4. Step #4: All Financial Independent Variables and Medium-Large Firm Size and Income Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 4 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial independent variables, MEDIUM and LARGE firm size dummy variables, and the INCOME level dummy variable. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINS\text{LACK}_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBT\text{EBITDA}_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x} \quad (47)$$

The results are based on 21,500 observations. The F value is high at 2,458.40, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4778, implying that the model has explanatory power.

All VIV and Tolerance estimates are satisfactory except for the two firm size dummies which are above the 3.00 level for VIV and about 0.32 for Tolerance estimates. All results for financial variables are statistically significant.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, the results are rejected due to the poor collinearity diagnostics of the firm size dummies.

Table 69: Financial Independent Variables and Medium-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Medium-Large firm size dummy variable selection. The operative equation (47) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. "MEDIUM" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	2,458.40	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"MEDIUM"	3.04437	0.32847	-0.02075	-2.41	0.0159**
"LARGE"	3.16040	0.31642	-0.02046	-2.34	0.0195**
EMERGING	1.08663	0.92027	-0.01709	-3.33	0.0009***
EBIT_TOAS	1.33181	0.75086	0.16689	29.34	<.0001***
NWC_TOAS	1.35900	0.73584	-0.73583	-128.06	<.0001***
MOVEABLE_TOAS	1.04554	0.95644	0.02206	4.38	<.0001***
DEBT_EBITDA	1.00016	0.99984	0.04715	9.57	<.0001***
IC	1.03404	0.96708	-0.08326	-16.61	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 4 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial independent variables, MEDIUM and LARGE firm size dummy variables, and the INCOME level dummy variable. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x} \quad (48)$$

The results are based on 18,019 observations. The F value is moderately high at 197.81, and results for the model are statistically significant. This suggests the model is moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.0808, implying that the model has limited explanatory power.

All VIV and Tolerance estimates are satisfactory except for the two firm size dummies which are at or above the 3.00 level for VIV and about 0.325 for Tolerance estimates. All results for financial variables are statistically significant except for EBIT/ASSETS.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research that there is a

positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, the results are rejected due to the poor collinearity diagnostics of the firm size dummies.

Table 70: Financial Independent Variables and Medium-Large Firm Size and Income Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Medium-Large firm size dummy variable selection. The operative equation (48) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is LTD/ASSETS. Independent variables are described in Table 5. “MEDIUM” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, income and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	197.81	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“MEDIUM”	3.00752	0.33250	-0.06281	-5.07	<.0001***
“LARGE”	3.14244	0.31822	-0.02993	-2.36	0.0181**
EMERGING	1.09777	0.91093	-0.06416	-8.57	<.0001***
EBIT_TOAS	1.09539	0.91292	0.00088309	0.12	0.9060
NWC_TOAS	1.12250	0.89087	-0.15882	-20.98	<.0001***
MOVEABLE_TOAS	1.06107	0.94245	0.13901	18.89	<.0001***
DEBT_EBITDA	1.00024	0.99976	0.08100	11.34	<.0001***
IC	1.05784	0.94532	-0.10366	-14.11	<.0001***

5. Step #5: All Financial Independent Variables and Small-Large Firm Size and Sector Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 5 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial independent variables, SMALL and LARGE firm size dummy variables, and the SECTOR dummy variables. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSLACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \varepsilon_{i,x} \quad (49)$$

The results are based on 21,500 observations. The F value is high at 1,964.99, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4776, implying that the model has explanatory power.

All VIV and Tolerance estimates are satisfactory. All results for financial variables are statistically significant. However, two of the three SECTOR dummy variables (Agriculture, Resources and Construction) are not statistically significant.

The model suggests the SMALL variable has a greater effect than the LARGE variable on the dependent variable compared to MEDIUM. This is inconsistent with the core premise of the research regarding firm size and credit access. The model results show the LARGE firm size dummy is not statistically significant.

Table 71: Financial Independent Variables and Small-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Small-Large firm size dummy variable selection. The operative equation (49) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, sector and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	1,964.99	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.21781	0.82115	0.01085	1.99	0.0462**
“LARGE”	1.21925	0.82018	0.00479	0.88	0.3792
AGRICULTURE	1.03686	0.96445	-0.00087282	-0.17	0.8620
RESOURCES_CONSTRUCTION	1.11668	0.89551	0.00254	0.49	0.6260
MANUFACTURING	1.14677	0.87202	0.01036	1.96	0.0497**
EBIT_TOAS	1.32869	0.75262	0.16613	29.23	<.0001***
NWC_TOAS	1.36271	0.73383	-0.73630	-127.93	<.0001***
MOVEABLE_TOAS	1.03560	0.96562	0.01964	3.91	<.0001***
DEBT_EBITDA	1.00074	0.99926	0.04722	9.57	<.0001***
IC	1.03206	0.96894	-0.08261	-16.49	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 5 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial independent variables, SMALL and LARGE firm size dummy variables, and the SECTOR dummy variables. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTEBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x} \quad (50)$$

The results are based on 18,019 observations. The F value is moderately high at 176.15, and results for the model are statistically significant. This suggests the model is moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.0891, implying that the model has limited explanatory power.

All VIV and Tolerance estimates are satisfactory. All results for SECTOR dummy variables are statistically significant. Results for financial variables are statistically significant except for EBIT/ASSETS.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a

positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 72: Financial Independent Variables and Small-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Small-Large firm size dummy variable selection. The operative equation (50) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7SMALL_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, sector and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	176.15	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.25097	0.79938	0.03142	3.95	<.0001***
“LARGE”	1.25353	0.79775	0.05232	6.57	<.0001***
AGRICULTURE	1.03544	0.96578	-0.03010	-4.16	<.0001***
RESOURCES_CONSTRUCTION	1.11596	0.89609	-0.01952	-2.60	0.0094***
MANUFACTURING	1.14759	0.87139	-0.11636	-15.27	<.0001***
EBIT_TOAS	1.08706	0.91991	-0.00738	-1.00	0.3195
NWC_TOAS	1.12887	0.88584	-0.14939	-19.77	<.0001***
MOVEABLE_TOAS	1.04679	0.95530	0.13639	18.74	<.0001***
DEBT_EBITDA	1.00085	0.99915	0.07935	11.15	<.0001***
IC	1.04861	0.95364	-0.09742	-13.38	<.0001***

6. Step #6: All Financial Independent Variables and Medium-Large Firm Size and Sector Dummies

a) DEBT/ASSETS as Dependent Variable

The Step 6 model testing independent variables and firm size dummies in relation to DEBT/ASSETS as the dependent variable is based on inclusion of all financial independent variables, MEDIUM and LARGE firm size dummy variables, and the SECTOR dummy variables. This is represented by the following equation:

$$DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTEBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \epsilon_{i,x} \quad (51)$$

The results are based on 21,500 observations. The F value is high at 1,965.22, and results for the model are statistically significant. This suggests the model is helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.4777, implying that the model has explanatory power.

All VIV and Tolerance estimates are satisfactory except for the two firm size dummies, which show VIV at above 3.00 and Tolerance estimates below 0.33. All results for financial variables are statistically significant. However, two of the three SECTOR dummy variables (Agriculture, Resources and Construction) are not statistically significant.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research regarding firm size and credit access. The LARGE firm size dummy shows a low level of statistical significance. However, model results are rejected due to collinearity weaknesses for firm size dummies.

Table 73: Financial Independent Variables and Medium-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—DEBT/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Medium-Large firm size dummy variable selection. The operative equation (51) is $DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. "MEDIUM" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, sector and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	21,500	1,965.22	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"MEDIUM"	3.04010	0.32894	-0.01956	-2.27	0.0229**
"LARGE"	3.05643	0.32718	-0.01568	-1.82	0.0689*
AGRICULTURE	1.03687	0.96444	-0.00089018	-0.18	0.8593
RESOURCES_CONSTRUCTION	1.11671	0.89549	0.00249	0.48	0.6322
MANUFACTURING	1.14678	0.87201	0.01039	1.97	0.0491**
EBIT_TOAS	1.32867	0.75263	0.16614	29.23	<.0001***
NWC_TOAS	1.36254	0.73392	-0.73619	-127.92	<.0001***
MOVEABLE_TOAS	1.03560	0.96563	0.01963	3.91	<.0001***
DEBT_EBITDA	1.00075	0.99926	0.04723	9.58	<.0001***
IC	1.03208	0.96891	-0.08257	-16.49	<.0001***

b) LTD/ASSETS as Dependent Variable

The Step 6 model testing independent variables and firm size dummies in relation to LTD/ASSETS as the dependent variable is based on inclusion of all financial independent variables, MEDIUM and LARGE firm size dummy variables, and the SECTOR dummy variables. This is represented by the following equation:

$$LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1EBIT_{i,x} + \beta_2FINSACK_{i,x} + \beta_3IMMOVEABLE_{i,x} + \beta_4MOVEABLE_{i,x} + \beta_5DEBTBITDA_{i,x} + \beta_6IC_{i,x} + \beta_7MEDIUM_{i,x} + \beta_8LARGE_{i,x} + \beta_9SECTOR_{i,x1} + \beta_{10}SECTOR_{i,x2} + \beta_{11}SECTOR_{i,x3} + \varepsilon_{i,x} \quad (52)$$

The results are based on 18,019 observations. The F value is moderately high at 176.42, and results for the model are statistically significant. This suggests the model is moderately helpful in explaining variances between groups compared to variances within those groups. However, the R-square is 0.0892, implying that the model has limited explanatory power.

All VIV and Tolerance estimates are satisfactory except for the two firm size dummies, which show VIV at about 3.0 and Tolerance estimates at 0.33. All results for SECTOR dummy are statistically significant. This is also true for financial variables except for EBIT/ASSETS.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research regarding firm size and credit access. The model results show the LARGE firm size dummy is not statistically significant. However, the model results are rejected due to the collinearity weaknesses for firm size dummies described above.

Table 74: Financial Independent Variables and Medium-Large Firm Size and Sector Dummy Model ANOVA and Collinearity Diagnostic Results—LTD/ASSETS as Dependent Variable

This table presents collinearity results for financial independent variables and Medium-Large firm size dummy variable selection. The operative equation (52) is $LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 EBIT_{i,x} + \beta_2 FINSLACK_{i,x} + \beta_3 IMMOVEABLE_{i,x} + \beta_4 MOVEABLE_{i,x} + \beta_5 DEBTBITDA_{i,x} + \beta_6 IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is DEBT/ASSETS. Independent variables are described in Table 5. “MEDIUM” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy. These are segmented by firm size dummy, sector and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	18,019	176.42	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“MEDIUM”	2.99555	0.33383	-0.05232	-4.25	<.0001***
“LARGE”	3.03259	0.32975	-0.00410	-0.33	0.7405
AGRICULTURE	1.03545	0.96576	-0.03015	-4.17	<.0001***
RESOURCES_CONSTRUCTION	1.11600	0.89606	-0.01959	-2.61	0.0091***
MANUFACTURING	1.14759	0.87139	-0.11632	-15.27	<.0001***
EBIT_TOAS	1.08730	0.91971	-0.00721	-0.97	0.3312
NWC_TOAS	1.12883	0.88587	-0.14926	-19.75	<.0001***
MOVEABLE_TOAS	1.04679	0.95530	0.13639	18.74	<.0001***
DEBT_EBITDA	1.00085	0.99915	0.07936	11.15	<.0001***
IC	1.04862	0.95363	-0.09738	-13.37	<.0001***

C. Log Transformation Regression Results for Large-Scale Firm Size Dummy Effects

The operative equations for each of the steps for the log transformation regression results are presented in Table 75 below.

Table 75: Overview of Large-Scale Firm Size Regression Equations

This table provides all the equations used in the log transformation regressions. Panel (1) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and SMALL-LARGE firm size dummy variables on the right-hand side. Panel (2) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and MEDIUM-LARGE firm size dummy variables on the right-hand side. Panel (3) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and SMALL-LARGE firm size dummy variables and income dummy on the right-hand side. Panel (4) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and MEDIUM-LARGE firm size dummy variables and income dummy on the right-hand side. Panel (5) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and SMALL-LARGE firm size dummy variables and sector dummies on the right-hand side. Panel (6) provides the equations for logDEBT/TOAS and logLTD/TOAS as dependent variables on the left-hand side and all financial independent variables (all with log transformation values) and MEDIUM-LARGE firm size dummy variables and sector dummies on the right-hand side. Step number corresponds to the step number for the testing. Equation number applies to econometric specifications for each test.

Step No.	Equation	Equation No.
1	Panel 1: All Financial Independent Variables and Small-Large Firm Size Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x}$	(53)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x}$	(54)
2	Panel 2: All Financial Independent Variables and Medium-Large Firm Size Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x}$	(55)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x}$	(56)
3	Panel 3: All Financial Independent Variables and Small-Large Firm Size and Income Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \epsilon_{i,x}$	(57)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \epsilon_{i,x}$	(58)
4	Panel 4: All Financial Independent Variables and Medium-Large Firm Size and Income Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \epsilon_{i,x}$	(59)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \epsilon_{i,x}$	(60)
5	Panel 5: All Financial Independent Variables and Small-Large Firm Size and Sector Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$	(61)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$	(62)
6	Panel 6: All Financial Independent Variables and Medium-Large Firm Size and Sector Dummies	
	$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$	(63)
	$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$	(64)

1. *Step #1: All Financial Independent Variables and Small-Large Firm Size Dummies*

a) *logDEBT/ASSETS as Dependent Variable*

The Step 1 model testing financial independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is represented by the following equation:

$$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x} \quad (53)$$

The results are based on 13,698 observations. The F value is very high at 25,846.90, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9297, implying the model has explanatory power. The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the underlying premise that firm size is positively correlated with credit access. Model results also show the SMALL firm size dummy has weak statistical significance.

Table 76: All Financial Variables and Small-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (53) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. "SMALL" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	25,846.9	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"SMALL"	1.18941	0.84076	-0.00430	-1.74	0.0818*
"LARGE"	1.20911	0.82706	0.00852	3.42	0.0006***
logEBIT_TOAS	1.33789	0.74744	0.36981	141.05	<.0001***
logNWC_TOAS	1.18001	0.84745	-0.02436	-9.89	<.0001***
logMOVEABLE_TOAS	1.07558	0.92973	0.08239	35.04	<.0001***
logDEBT_EBITDA	1.99870	0.50032	1.03667	323.49	<.0001***
logIC	2.19309	0.45598	-0.02670	-7.95	<.0001***

b) *logLTD/ASSETS as Dependent Variable*

The Step 1 model testing financial independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x} \quad (54)$$

The results are based on 11,049 observations. The F value is high at 1,371.72, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is low at 0.4651, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All results for financial variables are statistically significant.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 77: All Financial Variables and Small-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (54) is $\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	1,371.72	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.22211	0.81825	0.02447	3.18	0.0015***
“LARGE”	1.24445	0.80356	0.07259	9.35	<.0001***
logEBIT_TOAS	1.36022	0.73517	0.27016	33.28	<.0001***
logNWC_TOAS	1.16004	0.86204	-0.06712	-8.95	<.0001***
logMOVEABLE_TOAS	1.07536	0.92992	0.06800	9.42	<.0001***
logDEBT_EBITDA	2.02058	0.49491	0.71052	71.82	<.0001***
logIC	2.19599	0.45538	-0.02507	-2.43	0.0151**

2. Step #2: All Financial Independent Variables and Medium-Large Firm Size Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 2 model testing financial independent variables and firm size dummies in relation to logDEBT/ASSETS as the dependent variable is represented by the following equation:

$$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x} \quad (55)$$

The results are based on 13,698 observations. The F value is very high at 25,848.10, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances

between groups compared to variances within those groups. The R-square is also 0.9297, implying the model has explanatory power. The model also shows strong collinearity results for the financial variables, with limited VIV and reasonable Tolerance estimates.

The model suggests the LARGE variable has a greater effect than the MEDIUM variable on the dependent variable compared to SMALL. This is consistent with the underlying premise of the research that there is a positive correlation between firm size and credit access. The MEDIUM firm size dummy shows a low level of statistical significance. However, the model's results are rejected because both firm size dummy variables show very high VIV at about 3.90 and low Tolerance estimates below 0.26.

Table 78: All Financial Variables and Medium-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (55) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. "MEDIUM" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	25,848.1	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"MEDIUM"	3.86781	0.25854	0.00846	1.90	0.0579*
"LARGE"	3.96179	0.25241	0.01743	3.86	0.0001***
logEBIT_TOAS	1.33793	0.74743	0.36979	141.04	<.0001***
logNWC_TOAS	1.18000	0.84745	-0.02436	-9.89	<.0001***
logMOVEABLE_TOAS	1.07555	0.92976	0.08239	35.05	<.0001***
logDEBT_EBITDA	1.99853	0.50037	1.03664	323.50	<.0001***
logIC	2.19321	0.45595	-0.02675	-7.97	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 2 model testing financial independent variables and firm size dummies in relation to logLTD/ASSETS as the dependent variable is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \varepsilon_{i,x} \quad (56)$$

The results are based on 11,049 observations. The F value is high at 1,371.57, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is low at 0.4651, implying the model has explanatory power.

The model shows strong collinearity results for all financial variables, with limited VIV and reasonable Tolerance estimates. All results are statistically significant.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research that there is a

positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, both firm size dummy variables show very high VIV at about 3.70-3.80 and low Tolerance estimates below 0.27. Therefore, because of the poor collinearity diagnostics, the results are rejected.

Table 79: All Financial Variables and Medium-Large Firm Size Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (56) is $\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT_EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \epsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. "MEDIUM" and "LARGE" are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and firm size dummy. These are segmented by firm size dummy and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	1,371.57	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
"MEDIUM"	3.70434	0.26995	-0.04143	-3.09	0.0020***
"LARGE"	3.80171	0.26304	0.02712	2.00	0.0457**
logEBIT_TOAS	1.36029	0.73514	0.27015	33.28	<.0001***
logNWC_TOAS	1.16004	0.86204	-0.06712	-8.95	<.0001***
logMOVEABLE_TOAS	1.07535	0.92993	0.06802	9.42	<.0001***
logDEBT_EBITDA	2.02042	0.49495	0.71045	71.81	<.0001***
logIC	2.19598	0.45538	-0.02514	-2.44	0.0148**

3. Step #3: All Financial Independent Variables and Small-Large Firm Size and Income Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 3 model testing financial independent variables and firm size and income level dummies in relation to logDEBT/ASSETS as the dependent variable is represented by the following equation:

$$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT_EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \epsilon_{i,x} \quad (57)$$

The results are based on 13,698 observations. The F value is very high at 22,641.41, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9297, implying the model has considerable explanatory power.

The model also shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All results are statistically significant for financial variables and the income level dummy.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Model results show the SMALL dummy is not statistically significant.

Table 80: Financial Variables and Small-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (57) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 MEDIUM_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	22,641.10	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	0.83863	1.19243	-0.00382	-1.54	0.1226
“LARGE”	0.78242	1.27808	0.00621	2.43	0.0153**
EMERGING	0.83283	1.20073	-0.00963	-3.88	0.0001***
logEBIT_TOAS	0.73147	1.36712	0.37131	140.17	<.0001***
logNWC_TOAS	0.84481	1.18369	-0.02383	-9.67	<.0001***
logMOVEABLE_TOAS	0.92584	1.08010	0.08298	35.24	<.0001***
logDEBT_EBITDA	0.49360	2.02592	1.03522	321.02	<.0001***
logIC	0.42682	2.34293	-0.03010	-8.68	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 3 model testing financial independent variables and firm size and income level dummies in relation to logLTD/ASSETS as the dependent variable is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x} \quad (58)$$

The results are based on 11,049 observations. The F value is high at 1,257.08, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.4767, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. All financial variables are statistically significant as is the income level dummy.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access.

Table 81: Financial Variables and Small-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (58) $\logLTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \logEBIT_{i,x} + \beta_2 \logFINSLACK_{i,x} + \beta_3 \logIMMOVEABLE_{i,x} + \beta_4 \logMOVEABLE_{i,x} + \beta_5 \logDEBTEBITDA_{i,x} + \beta_6 \logIC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	1,257.08	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.22699	0.81500	0.03197	4.19	<.0001***
“LARGE”	1.29257	0.77365	0.04902	6.26	<.0001***
EMERGING	1.20899	0.82714	-0.11816	-15.61	<.0001***
logEBIT_TOAS	1.39519	0.71675	0.29026	35.69	<.0001***
logNWC_TOAS	1.16198	0.86060	-0.06238	-8.40	<.0001***
logMOVEABLE_TOAS	1.07964	0.92623	0.07503	10.49	<.0001***
logDEBT_EBITDA	2.04589	0.48879	0.69343	70.42	<.0001***
logIC	2.38988	0.41843	-0.07239	-6.80	<.0001***

4. Step #4: All Financial Independent Variables and Medium-Large Firm Size and Income Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 4 model testing financial independent variables and firm size and income level dummies in relation to logDEBT/ASSETS as the dependent variable is represented by the following equation:

$$\logDEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \logEBIT_{i,x} + \beta_2 \logFINSLACK_{i,x} + \beta_3 \logIMMOVEABLE_{i,x} + \beta_4 \logMOVEABLE_{i,x} + \beta_5 \logDEBTEBITDA_{i,x} + \beta_6 \logIC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x} \quad (59)$$

The results are based on 13,698 observations. The F value is very high at 22,642.00, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9297, implying the model has considerable explanatory power.

The model also shows strong collinearity results for the independent variables and income dummy, with limited VIV and reasonable Tolerance estimates. All results are statistically significant for financial variables and the income level dummy.

The model suggests the LARGE variable has a greater effect than the MEDIUM variable on the dependent variable compared to SMALL. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The results indicate the MEDIUM dummy shows a low level of statistical significance.

Table 82: Financial Variables and Medium-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (59) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTEBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “MEDIUM” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	22,642.00	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“MEDIUM”	3.87782	0.25788	0.00758	1.70	0.0894*
“LARGE”	4.09834	0.24400	0.01419	3.09	0.0020***
EMERGING	1.20078	0.83279	-0.00961	-3.87	0.0001***
logEBIT_TOAS	1.36717	0.73144	0.37129	140.16	<.0001***
logNWC_TOAS	1.18369	0.84482	-0.02383	-9.67	<.0001***
logMOVEABLE_TOAS	1.08008	0.92586	0.08298	35.24	<.0001***
logDEBT_EBITDA	2.02575	0.49364	1.03519	321.03	<.0001***
logIC	2.34300	0.42680	-0.03014	-8.69	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 4 model testing financial independent variables and firm size and income level dummies in relation to logLTD/ASSETS as the dependent variable is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTEBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x} \quad (60)$$

The results are based on 11,049 observations. The F value is high at 1,256.92, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.4767, implying the model has explanatory power.

The model shows strong collinearity results for the financial variables and income dummy variable, with limited VIV and reasonable Tolerance estimates. All financial variables are statistically significant as is the income level dummy. However, the collinearity diagnostics for the two firm size dummies are poor, with high VIV in the 3.70-3.90 range and low Tolerance estimates below 0.27.

The model suggests the MEDIUM variable has a greater effect than the LARGE variable on the dependent variable compared to SMALL. This is inconsistent with the core premise of the research that there is a positive correlation between firm size and credit access. The model results show the LARGE dummy is not statistically significant. However, the model results are rejected due to the collinearity problems described above for the firm size dummies.

Table 83: Financial Variables and Medium-Large Firm Size and Income Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (60) $\logLTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \logEBIT_{i,x} + \beta_2 \logFINSLACK_{i,x} + \beta_3 \logIMMOVEABLE_{i,x} + \beta_4 \logMOVEABLE_{i,x} + \beta_5 \logDEBTBITDA_{i,x} + \beta_6 \logIC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 INCOME_{i,x} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “MEDIUM” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, income level dummy, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	1,256.92	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“MEDIUM”	3.71937	0.26886	-0.05460	-4.11	<.0001***
“LARGE”	3.92627	0.25469	-0.01080	-0.79	0.4285
EMERGING	1.20907	0.82708	-0.11813	-15.60	<.0001***
logEBIT_TOAS	1.39528	0.71670	0.29025	35.69	<.0001***
logNWC_TOAS	1.16199	0.86059	-0.06237	-8.40	<.0001***
logMOVEABLE_TOAS	1.07964	0.92623	0.07506	10.49	<.0001***
logDEBT_EBITDA	2.04573	0.48882	0.69336	70.41	<.0001***
logIC	2.38983	0.41844	-0.07245	-6.81	<.0001***

5. Step #5: All Financial Independent Variables and Small-Large Firm Size and Sector Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 5 model testing independent variables and firm size and sector dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$\logDEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \logEBIT_{i,x} + \beta_2 \logFINSLACK_{i,x} + \beta_3 \logIMMOVEABLE_{i,x} + \beta_4 \logMOVEABLE_{i,x} + \beta_5 \logDEBTBITDA_{i,x} + \beta_6 \logIC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \varepsilon_{i,x} \quad (61)$$

The results are based on 13,698 observations. The F value is high at 18,212.10, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9301, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. Results for all three sectors and financial variables are statistically significant.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. The results show the SMALL dummy has a low level of statistical significance.

Table 84: Financial Variables and Small-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (61) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	18,212.10	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.19169	0.83914	-0.00471	-1.91	0.0562*
“LARGE”	1.21808	0.82096	0.00996	3.99	<.0001***
AGRICULTURE	1.04920	0.95311	-0.00961	-4.15	<.0001***
RESOURCES_CONSTRUCTION	1.13653	0.87987	-0.01171	-4.86	<.0001***
MANUFACTURING	1.33612	0.74844	-0.02293	-8.78	<.0001***
logEBIT_TOAS	1.33999	0.74627	0.36893	141.03	<.0001***
logNWC_TOAS	1.21482	0.82317	-0.02076	-8.34	<.0001***
logMOVEABLE_TOAS	1.22804	0.81430	0.08984	35.88	<.0001***
logDEBT_EBITDA	2.00973	0.49758	1.03811	324.03	<.0001***
logIC	2.21118	0.45225	-0.02552	-7.59	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 5 model testing independent variables and firm size and sector dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x} \quad (62)$$

The results are based on 11,049 observations. The F value is high at 997.74, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.4748, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. However, the results for logIC are not statistically significant.

The model suggests the LARGE variable has a greater effect than the SMALL variable on the dependent variable compared to MEDIUM. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant.

Table 85: Financial Variables and Small-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (62) is $\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 SMALL_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “SMALL” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	997.74	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“SMALL”	1.22355	0.81730	0.02141	2.81	0.0050***
“LARGE”	1.25235	0.79850	0.07783	10.08	<.0001***
AGRICULTURE	1.04807	0.95413	-0.02212	-3.13	0.0017***
RESOURCES_CONSTRUCTION	1.13795	0.87877	-0.01843	-2.50	0.0123**
MANUFACTURING	1.33591	0.74855	-0.11181	-14.02	<.0001***
logEBIT_TOAS	1.36289	0.73373	0.26551	32.97	<.0001***
logNWC_TOAS	1.19732	0.83520	-0.04832	-6.40	<.0001***
logMOVEABLE_TOAS	1.22481	0.81646	0.10591	13.87	<.0001***
logDEBT_EBITDA	2.03765	0.49076	0.72251	73.37	<.0001***
logIC	2.21996	0.45046	-0.01310	-1.27	0.2024

6. Step #6: All Financial Independent Variables and Medium-Large Firm Size and Sector Dummies

a) logDEBT/ASSETS as Dependent Variable

The Step 6 model testing independent variables and firm size and sector dummies in relation to logDEBT/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBTBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \epsilon_{i,x} \quad (63)$$

The results are based on 13,698 observations. The F value is high at 18,213.00, and results for the model are statistically significant. This suggests the model would be very helpful in explaining variances between groups compared to variances within those groups. The R-square is also 0.9301, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. Results for all three sectors and financial variables are statistically significant.

The model suggests the LARGE variable has a greater effect than the MEDIUM variable on the dependent variable compared to SMALL. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. In addition, both firm size dummies are statistically significant. However, the results are rejected due to the high VIV (just below 4.00) for the two firm size dummies and low Tolerance estimates of less than 0.26.

Table 86: Financial Variables and Medium-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logDEBT/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (63) is $\log DEBT_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is logDEBT/ASSETS. Independent variables are described in Table 5. “MEDIUM” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	13,698	18,213.00	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“MEDIUM”	3.87510	0.25806	0.00917	2.06	0.0392**
“LARGE”	3.97790	0.25139	0.01964	4.36	<.0001***
AGRICULTURE	1.04918	0.95312	-0.00961	-4.15	<.0001***
RESOURCES_CONSTRUCTION	1.13651	0.87989	-0.01170	-4.86	<.0001***
MANUFACTURING	1.33610	0.74844	-0.02294	-8.78	<.0001***
logEBIT_TOAS	1.34003	0.74625	0.36891	141.02	<.0001***
logNWC_TOAS	1.21481	0.82317	-0.02076	-8.34	<.0001***
logMOVEABLE_TOAS	1.22799	0.81434	0.08985	35.88	<.0001***
logDEBT_EBITDA	2.00957	0.49762	1.03809	324.05	<.0001***
logIC	2.21128	0.45223	-0.02556	-7.61	<.0001***

b) logLTD/ASSETS as Dependent Variable

The Step 6 model testing independent variables and firm size and sector dummies in relation to logLTD/ASSETS as the dependent variable is based on inclusion of all financial variables, firm size dummies and sector dummy variables. This is represented by the following equation:

$$\log LTD_{i,x}/TOAS_{i,x} = \beta_0 + \beta_1 \log EBIT_{i,x} + \beta_2 \log FINSLACK_{i,x} + \beta_3 \log IMMOVEABLE_{i,x} + \beta_4 \log MOVEABLE_{i,x} + \beta_5 \log DEBT EBITDA_{i,x} + \beta_6 \log IC_{i,x} + \beta_7 MEDIUM_{i,x} + \beta_8 LARGE_{i,x} + \beta_9 SECTOR_{i,x1} + \beta_{10} SECTOR_{i,x2} + \beta_{11} SECTOR_{i,x3} + \varepsilon_{i,x} \quad (64)$$

The results are based on 11,049 observations. The F value is high at 997.65, and results for the model are statistically significant. This suggests the model would be helpful in explaining variances between groups compared to variances within those groups. The R-square is 0.4747, implying the model has explanatory power.

The model shows strong collinearity results, with limited VIV and reasonable Tolerance estimates. However, the results for logIC are not statistically significant.

The model suggests the LARGE variable has a greater effect than the MEDIUM variable on the dependent variable compared to SMALL. This is consistent with the core premise of the research that there is a positive correlation between firm size and credit access. Both firm size dummies are statistically significant. However, the results are rejected due to the high VIV in the 3.70-3.80 range for the two firm size dummies and low Tolerance estimates of less than 0.27.

Table 87: Financial Variables and Medium-Large Firm Size and Sector Dummy Variables ANOVA and Collinearity Diagnostic Results—logLTD/ASSETS as Dependent Variable

This table presents the model collinearity results for variable selection. The operative equation (64) is $\log LTD_{i,x}/TOAS_{i,x} = \theta_0 + \theta_1 \log EBIT_{i,x} + \theta_2 \log FINSLACK_{i,x} + \theta_3 \log IMMOVEABLE_{i,x} + \theta_4 \log MOVEABLE_{i,x} + \theta_5 \log DEBT EBITDA_{i,x} + \theta_6 \log IC_{i,x} + \theta_7 MEDIUM_{i,x} + \theta_8 LARGE_{i,x} + \theta_9 SECTOR_{i,x1} + \theta_{10} SECTOR_{i,x2} + \theta_{11} SECTOR_{i,x3} + \varepsilon_{i,x}$. The dependent variable is logLTD/ASSETS. Independent variables are described in Table 5. “MEDIUM” and “LARGE” are dummy variables to capture firm size effects. Panel (1) provides the model ANOVA summary. N is for total observations used. Panel (2) presents collinearity results by independent variable and dummy variables. These are segmented by firm size dummy, sector dummies, and financial variables. Column (1) presents Variance Inflation (VIV) values. Column (2) presents Tolerance estimates. Column (3) presents Standardized Estimates for parameters. Column (4) presents t-values. Column (5) presents statistical significance results. Results are based on a full model fitted with confidence levels at 95%. Parameter estimates: *significant at 10%; **significant at 5%; ***significant at 1%.

Panel 1: Model ANOVA Summary					
	n	F Value	Pr > F		
	11,049	997.65	<.0001		
Panel 2: Collinearity Diagnostic Results					
	(1) VIV	(2) Tolerance	(3) St. Estimate	(4) t-value	(5) Pr > (t)
“MEDIUM”	3.70853	0.26965	-0.03620	-2.72	0.0064***
“LARGE”	3.81558	0.26208	0.03808	2.83	0.0047***
AGRICULTURE	1.04804	0.95416	-0.02218	-3.14	0.0017***
RESOURCES_CONSTRUCTION	1.13795	0.87878	-0.01842	-2.50	0.0123**
MANUFACTURING	1.33589	0.74857	-0.11184	-14.03	<.0001***
logEBIT_TOAS	1.36296	0.73370	0.26550	32.97	<.0001***
logNWC_TOAS	1.19732	0.83520	-0.04832	-6.40	<.0001***
logMOVEABLE_TOAS	1.22477	0.81648	0.10594	13.88	<.0001***
logDEBT_EBITDA	2.03750	0.49080	0.72245	73.37	<.0001***
logIC	2.21994	0.45046	-0.01317	-1.28	0.2002

D. Main Observations

The results from baseline regressions and log transformation regressions modifying the firm size dummy variables show differing patterns, but similar challenges of collinearity. In the case of baseline regression robustness test results, more are negative than positive in terms of firm size effects in relation to the premise of positive correlation. Among the six model results that are accepted, only two were consistent with the underlying premise of positive correlation, while four rejected. Half the model results were rejected. Therefore, the general observation is that the results are generally inconclusive, but slightly skewed towards rejection.

As for the log transformation results, standardized parameter estimates strongly supported the premise of positive correlation in firm size effects on credit access. Among seven model results that are accepted, all were consistent with the underlying premise of positive correlation. However, five of 12 model results were not accepted, reflecting issues of collinearity.

In sum, robustness tests in Section 6 neither confirm nor refute the underlying premise of firm size effects on credit access. However, among the accepted results, there is more support for the relevant hypotheses (nine) than rejecting (four).

VII. Findings and Observations

A. General Observations

Based on the Level 2 sample, univariate data generally demonstrate that large-scale firms dominate credit markets across the globe and across sectors. SMEs only account for a small fraction of total credit and LTD despite the much larger number of SMEs. This partly reflects the sample bias that heavily weights the influence of large-scale firms on results.

Baseline regression results (in Section 4) show near balance between support for and rejection of the firm size bias premise that underlies most of the thesis research focus. However, this observation is weakened by test results that cannot be accepted due to problems of multicollinearity. Of the 11 test results accepted, six supported the relevant hypotheses and five rejected them. This also means that an additional seven test results were rejected.

Results are also balanced in terms of log transformation regressions (in Section 5) that modify the sample to eliminate outliers, while being strongly supportive of the relevant hypotheses with the modification of firm size dummies as robustness tests (in Section 6). Combined with the descriptive data and univariate distributions that largely support the underlying premise of the research, there is support for the premise that there is positive correlation between firm size and credit access. The total number of model results supporting the relevant hypotheses (20) outweighed those rejecting (14). The 2-pairwise t-test likewise supports the premise that there is a firm size effect. However, 30 of the 34 model results were rejected due to problems of collinearity.

The results that are acceptable are generally comprised of financial independent variables and dummy variables on the right-hand side of the equation. Only four of the tests that were accepted exclude financial independent variables on the right-hand side of the equation. They were split in results, with two supporting the relevant hypotheses related to the legal and institutional environment and two rejecting. This leaves a balance of 30 accepted test results with financial variables as independent variables, with 18 supporting relevant hypotheses and 12 rejecting the relevant hypotheses. Therefore, results from the tests indicate that the financial independent variables have more explanatory power than the legal and institutional variables, and that they tend to support the hypotheses rather than reject.

More specific to the financial variables, from a creditworthiness perspective, univariate data show that large-scale firms often show higher earnings which provides them with capacity to cover interest expense on borrowings. They typically have higher IC ratios, while large firms' EBIT/ASSETS and DEBT/EBITDA ratios reflect their ability to leverage earnings more than SMEs. This should provide lenders with greater confidence in the ability of these large-scale firms to cover principal requirements, and not just interest expense. The research has not studied fee income generated by lenders from their exposures to large-scale firms, although this is likely to be a contributing factor. Overall, large-scale firms in the Level 2 sample have shown sufficiently high ratios specific to credit quality to warrant their access to credit.

However, the original research also identified examples of where lenders may be missing out on opportunities to increase their earnings and diversify their loan portfolios by lending more (at higher net spreads) to SMEs. This relates to the outcome of statistical testing in the thesis. Rather than being universal and linear as might be expected, given the dominance of large-scale firms in the market combined with their superior earnings and higher levels of assets that can be pledged as collateral, the regression results showed that patterns of firm size effect on credit access are mixed. This was true for

baseline regressions as well as regression robustness tests with differing firm size dummies. Likewise, the log transformation results replicating the baseline regressions (Section 5) also showed balanced results. However, the 2-pairwise *t*-test in Section 4 confirmed there is a firm size effect, and this was strongly supported by log transformation regression results with differing firm size dummies (Section 6). In the end, results are balanced in most cases apart from log transformation regression results with differing firm size dummies where support for the hypotheses is strong.

Despite these regression and log transformation test results, much of the literature points out that SMEs face greater challenges in accessing credit, including LTD, than do large-scale firms. This is largely confirmed as well by the difference in dollar figures presented in the univariate data. However, the univariate data also show that the patterns and relationships in relation to shares of assets are not always so dissimilar, and that firms in the sample revealed some balance sheet positions that were not expected, namely higher shares of IMM/ASSETS for small firms and higher MOV/ASSETS and correspondingly less IMM/ASSETS for large-scale firms relative to small firms.

In some cases, SMEs' financial accounting ratios are not as strong as those of large-scale firms. However, in some cases, they equal or exceed large-scale firm ratios. Therefore, in many cases, there also appears to be an opportunity cost to lenders in not providing more credit to SMEs. Earlier research found that, in several cases, SMEs have high Interest Coverage ratios (due to low interest expense resulting from little or no debt) and higher levels of financial slack (surplus Net Working Capital) that should at least enable greater short-term credit access. Medium-sized firms in particular often show comparable levels of EBIT/ASSETS (earnings efficiency) as well as IC, and the larger firms in the medium-sized category also have high levels of tangible fixed assets that can be pledged as collateral. Therefore, the opportunity cost issue applies more to these firms than to small-scale firms. All of these patterns are consistent with the main research question and underlying hypotheses regarding positive correlation of firm size and credit access. However, the notion that small-scale firms sometimes have more favorable ratios than large-scale firms also provides context for why the test results in Sections 4-6 were mixed and did not universally confirm positive correlation of firm size and credit access.

One of the reasons why small-scale firms face greater challenges in accessing credit relates to capacity to pledge assets as collateral. Large-scale firms have greater absolute dollar values of assets that can be pledged as collateral, again providing them with an edge in the competition for lender resources. Small-scale firms have the least available TFA to pledge in dollar value. However, as a share of assets, SMEs have a greater share of IMM than originally expected, with ratios not dissimilar to those of large-scale firms. This should provide lenders with an incentive to increase loan exposure to SMEs, particularly medium-sized firms.

However, the presence of pledged assets alone is not enough to sway lenders in some cases. This is because the dollar value of IMM for small firms in particular is still relatively low, and because of difficulties faced by lenders in many business environments taking possession of collateral in the event of borrower default. Regression testing in Sections 4 and 5 showed legal and institutional variables often have poor collinearity diagnostics as variables describing credit access. Therefore, the testing did not amplify the direct impact of these variables on credit access by firm size. However, the Literature Review highlighted a number of issues faced by lenders in property registration, contract enforcement and insolvency, and these are factors in (un)willingness of lenders to provide credit, particularly long-term credit. In the end, most lender decisions appear to be case-specific to the NPV and cash flow of the specific

transaction along with the financial strength of the borrower and the business environment in which they operate. As the statistical testing did not do transaction-specific analysis, the ability to confirm or refute Hypotheses 4-5 in relation to pledged assets and collateral could not be achieved.

By extension, this suggests that many factors are related to the origination of credit, whether to large-scale firms or SMEs. This is made clear with the disparity in many patterns once the data are disaggregated and analyzed on an income, regional and sector basis. The varied patterns in test results for firm size effect reflect this. Therefore, the financial independent variables are useful in providing context for broader trends, but there are limitations to how much they explain in relation to credit and LTD access. As referenced above, there are transaction- and firm-specific characteristics above and beyond what is captured in the six financial independent variables used in the statistical testing for firm size effects on credit access. Moreover, because legal and institutional factors were less effective as descriptive variables in the testing, they are assumed to better match with macro-financial indicators like credit as a share of national GDP than they are in explaining firm-level credit access.

B. Summary of Testing Results

Statistical tests partly confirm the underlying premise of the research, that there is a positive correlation between firm size and credit access. Univariate results provide considerable support for the premise based on mean and median figures across firm sizes, including when tested by category (e.g., income level, region, listed status, sector). There are periodic deviations, but general patterns are broadly confirmed.

Meanwhile, the sum of most statistical tests broadly confirmed there is a firm size effect, as reflected in standardized estimates for firm size categories that also test for joint effects when testing for firm size and additional categories of interest. This is weakened by the lack of statistical significance for firm size dummies in most cases. However, when firm size dummies are all statistically significant, the firm size effect is confirmed. Likewise, 20 of 34 accepted regression and log transformation tests resulted in support for relevant hypotheses. Meanwhile, the 2-pairwise *t*-test likewise confirms that there are differences in access to type of credit within each revenue quantile, further justifying the rationale to test for underlying explanations about why there are differences and that there is a firm size effect.

While results offer broad confirmation of underlying premises for hypothesis testing, there are weaknesses in the data. ANOVA exposed problems of statistical significance for categories of interest, while regressions demonstrated heteroscedasticity in variances rather than constant variances. In the case of heteroscedasticity, this is not considered unusual for large cross-sectional samples. However, unacceptable VIF and low Tolerance estimates led to rejection of 30 of 64 tests, nearly half. Moreover, a handful of model results were accepted with caution because of acceptable but comparatively high VIF (2.50-3.00 range) and relatively low Tolerance estimates (less than 0.40).

Robustness tests were conducted to add confidence in the areas where baseline regressions were effective while also seeking to address weaknesses identified above. This was mainly considered to be a problem associated with sample bias and the presence of outliers in the sample attributed to very large companies. Therefore, log transformation was carried out to reduce skewness in the distribution to achieve a normal distribution. Despite these efforts, the log transformation robustness results (Section 5) do not confirm or reject the underlying premise of the research, that there is a positive correlation between firm size and credit access. The confirmation or rejection of the premise is balanced among these results, with five “Yes” and five “No”. However, Section 6 log transformation robustness results with

differing firm size dummies were strongly supportive of the underlying premise of the research, with seven “Yes” and zero “No”. This differed from the Section 6 regression robustness tests with differing firm size dummies, with two “Yes” and four “No”. Therefore, robustness tests in Sections 5 and 6 showed 14 “Yes” and nine “No” in support for the relevant hypotheses and underlying premise of the research.

Beyond the results, the log transformation sample size is much smaller. The log transformation has the effect of reducing the number of observations by about 8,000 for DEBT and 7,000 for LTD relationships. This helps to eliminate skewness, but adds the weakness of missing observations.

Table 88 summarizes all test results for all 64 equations found in Sections 4-6. In the end, among the results that can be accepted, there is a slight edge in support for standardized parameter estimates that show firm size effects are positively correlated with credit access. However, it is modest, with 20 of the 64 tests supporting this as opposed to 14 rejecting. This means results from 30 tests were not accepted due to issues of multicollinearity.

Most of the tests with acceptable results are based on financial independent variables and a mix of dummy variables. In this regard, 18 of the accepted model results excluding legal and institutional variables supported the premise of positive correlation, whereas 12 rejected. Two results from models without financial independent variables but with legal and institutional variables supported this position, while another two rejected the relevant hypotheses.

As noted above regarding the distribution of results, the Table shows that most of the tests supporting the research premise were from the log transformation results, although not exclusively. Six of the baseline regression results supported the premise (Panel 1) as did two of the baseline regression robustness tests (Panel 3). Moreover, there is nothing automatic about the method of testing used leading to a bias in results. Among the tests rejecting hypotheses and the core research premise, five of 14 were also from log transformation results, mostly from the robustness tests in Section 5 (Panel 2).

Table 88: Summary of Test Results

This table presents a summary of test results from Sections 4-6. The model column includes the relevant Equation numbers. Panel (1) presents baseline regression results from Section 4. Panel (2) presents robustness test results from Section 5. Panel (3) presents robustness test results from baseline regressions in Section 6. Panel (4) presents robustness test results from log transformation tests in Section 6. Column (1) specifies the dependent variable for each model presented. Column (2) denotes whether results support (“Yes”) or dispute (“No”) the premise of positive correlation between firm size and credit access. Column (3) specifies whether both firm size dummy results are statistically significant (“Yes”) or, if at least one is not (“No”). Column (4) notes whether model results can be accepted (“Yes”), accepted with caution due to issues of collinearity (“With caution due to collinearity”) or not accepted at all (“No”). Column (5) profiles support for (“Supports Hx”) or rejection of (“Rejects Hx”) specific hypotheses based strictly on model results that are accepted as per Column (4).

Panel 1: Baseline Regression Results					
Model	(1) Dependent Variable	(2) Positive Correlation	(3) Statistical Significance	(4) Model Acceptance	(5) Relation to Hypotheses
Full Model (Equations 5-6)	DEBT/TOAS	No	MEDIUM No	No	
	LTD/TOAS	Yes	SMALL No	No	
All Independent Variables and Firm Size Dummies (Equations 7-8)	DEBT/TOAS	No	MEDIUM No	With caution due to collinearity	Rejects H1-H7
	LTD/TOAS	Yes	SMALL No	Yes	Supports H1-H7
All Legal/Inst. Variables and All Dummies (Equations 9-10)	DEBT/TOAS	No	BOTH No	No	
	LTD/TOAS	Yes	SMALL No	No	
All Financial Variables and All Dummies (Equations 11-12)	DEBT/TOAS	No	MEDIUM No	No	
	LTD/TOAS	Yes	SMALL No	No	
All Financial Variables and Firm Size Dummies (Equations 13-14)	DEBT/TOAS	No	BOTH No	Yes	Rejects H1, H3, H4, H6
	LTD/TOAS	Yes	SMALL No	Yes	Supports H1, H3, H4, H6
All Financial Variables and Firm Size and Income Dummies (Equations 15-16)	DEBT/TOAS	No	MEDIUM No	Yes	Rejects H1, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
All Financial Variables and Firm Size and Regional Dummies (Equations 17-18)	DEBT/TOAS	No	MEDIUM No	No	
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
All Financial Variables and Firm Size and Listed Dummies (Equations 19-20)	DEBT/TOAS	No	BOTH No	Yes	Rejects H1, H4, H6
	LTD/TOAS	Yes	SMALL No	Yes	Supports H1, H3, H4, H6
All Financial Variables and Firm Size and Sector Dummies (Equations 21-22)	DEBT/TOAS	No	BOTH No	Yes	Rejects H1, H3, H4, H6
	LTD/TOAS	Yes	SMALL No	Yes	Supports H1, H4, H6
Panel 2: Log Transformation Regression Results					
Model	(1) Dependent Variable	(2) Positive Correlation	(3) Statistical Significance	(4) Model Acceptance	(5) Relation to Hypotheses
Full Model (Equations 23-24)	DEBT/TOAS	No	Yes	No	
	LTD/TOAS	Yes	SMALL No	No	
All Independent Variables and Firm Size Dummies (Equations 25-26)	DEBT/TOAS	No	MEDIUM No	With caution due to collinearity	Rejects H1-H7
	LTD/TOAS	Yes	SMALL No	With caution due to collinearity	Supports H1-H7

All Legal/Inst. Variables and All Dummies (Equations 27-28)	DEBT/TOAS	Yes	Yes	No	
	LTD/TOAS	Yes	Yes	No	
All Financial Variables and All Dummies (Equations 29-30)	DEBT/TOAS	No	Yes	No	
	LTD/TOAS	Yes	SMALL No	No	
All Financial Variables and Firm Size Dummies (Equations 31-32)	DEBT/TOAS	No	Yes	Yes	Rejects H1, H3, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H3, H4, H6
All Financial Variables and Firm Size and Income Dummies (Equations 33-34)	DEBT/TOAS	No	Yes	Yes	Rejects H1, H4, H6
	LTD/TOAS	Yes	SMALL No	Yes	Supports H1, H4, H6
All Financial Variables and Firm Size and Regional Dummies (Equations 35-36)	DEBT/TOAS	No	Yes	No	
	LTD/TOAS	Yes	SMALL No	No	
All Financial Variables and Firm Size and Listed Dummies (Equations 37-38)	DEBT/TOAS	No	Yes	Yes	Rejects H1, H3, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H3, H4, H6
All Financial Variables and Firm Size and Sector Dummies (Equations 39-40)	DEBT/TOAS	No	Yes	Yes	Rejects H1, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
Panel 3: Baseline Regression Robustness Results with Different Firm Size Dummies					
Model	(1) Dependent Variable	(2) Positive Correlation	(3) Statistical Significance	(4) Model Acceptance	(5) Relation to Hypotheses
All Financial Variables and Small-Large Firm Size Dummies (Equations 41-42)	DEBT/TOAS	No	LARGE No	Yes	Rejects H1, H3, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H3, H4, H6
All Financial Variables and Medium-Large Firm Size Dummies (Equations 43-44)	DEBT/TOAS	No	Yes	No	
	LTD/TOAS	No	LARGE No	No	
All Financial Variables and Small-Large Firm Size and Income Dummies (Equations 45-46)	DEBT/TOAS	No	LARGE No	Yes	Rejects H1, H4, H6
	LTD/TOAS	No	Yes	Yes	Rejects H1, H4, H6
All Financial Variables and Medium-Large Firm Size and Income Dummies (Equations 47-48)	DEBT/TOAS	No	Yes	No	
	LTD/TOAS	No	Yes	No	
All Financial Variables and Small-Large Firm Size and Sector Dummies (Equations 49-50)	DEBT/TOAS	No	LARGE No	Yes	Rejects H1, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
All Financial Variables and Medium-Large Firm Size and Sector Dummies (Equations 51-52)	DEBT/TOAS	No	LARGE No	No	
	LTD/TOAS	No	LARGE No	No	

Panel 4: Log Transformation Robustness Test Results with Different Firm Size Dummies					
Model	(1) Dependent Variable	(2) Positive Correlation	(3) Statistical Significance	(4) Model Acceptance	(5) Relation to Hypotheses
All Financial Variables and Small-Large Firm Size Dummies (Equations 53-54)	DEBT/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
All Financial Variables and Medium-Large Firm Size Dummies (Equations 55-56)	DEBT/TOAS	Yes	Yes	No	
	LTD/TOAS	No	Yes	No	
All Financial Variables and Small-Large Firm Size and Income Dummies (Equations 57-58)	DEBT/TOAS	Yes	SMALL No	Yes	Supports H1, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
All Financial Variables and Medium-Large Firm Size and Income Dummies (Equations 59-60)	DEBT/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
	LTD/TOAS	No	LARGE No	No	
All Financial Variables and Small-Large Firm Size and Sector Dummies (Equations 61-62)	DEBT/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
	LTD/TOAS	Yes	Yes	Yes	Supports H1, H4, H6
All Financial Variables and Medium-Large Firm Size and Sector Dummies (Equations 63-64)	DEBT/TOAS	Yes	Yes	No	
	LTD/TOAS	Yes	Yes	No	

C. Methodological Issues and Future Research

The Level 2 sample was based on disclosure of financial accounting information by firms around the globe. This resulted in a sample biased in favor of large-scale firms. SMEs accounted for about 38% of the Level 2 sample. This is not representative of the vast pool of SMEs around the world for which data are scarce or unavailable. However, the sample was useful in profiling firms on a comparative basis across income levels, regions and sectors in terms of their credit and LTD access, and on the basis of common financial measures used to analyze firm-specific competitiveness and loan performance.

The issue of financial accounting values used in the research remains a fundamental issue that likely understates the credit access advantages enjoyed by large-scale firms in the market. How this relates to the potential understatement of IMM values has been referenced above. The concept can be extended to equity for listed firms, of which most in the sample were large-scale. This applies as well to securities investments on the asset side of the balance sheet, a disproportionate amount of which is also held by large-scale firms. For equity and securities values (as with IMM), Tobin's Q and mark-to-market valuation would be helpful in providing more direct clarity about the degree to which large-scale firms enjoy a market advantage. Marking to market the financial value of assets and equity of large-scale listed firms would change the financial variable ratios. The effect would increase large-scale firm NWC/ASSETS ratios but reduce their EBIT/ASSETS unless the market-to-book differential were added to income statements, with gains helping to increase EBIT. In general, the effect would be to further increase incentives to lend to large-scale firms due to their higher value of liquid assets (that could be pledged) and greater earnings. In both cases, the mark-to-market valuations would help to explain why large-scale firms are able to

leverage their assets and earnings more than SMEs, as reflected in higher DEBT/EBITDA. It would also potentially strengthen the explanatory power of IMM as a variable and help to explain how pledged assets for secured transactions add to lender comfort above and beyond borrower IC ratios.

Addressing these issues would be helpful in future research. In addition, future research should tackle some of the greatest shortcomings of the research that are restricted by the lack of time series data. All the variables selected are snapshot figures or calculations based on latest year of available results. Over time, a more longitudinal approach would permit greater understanding of trends and patterns.

The data would also benefit from an expanded profile of the SMEs themselves. While practically all of the Level 2 sample firms have been operating firms for decades, some of the leading challenges in SME finance concern equity investment and start-up financing in knowledge-based, innovative sectors of the economy for young firms. While these are technically not SMEs at the beginning (as their revenues are less than \$2 million, and frequently zero for several years), they often represent future vibrant SMEs if they can access investment capital. The research has focused on more traditional SME credit, but future research will need to incorporate the role of IP, innovation, and intangible fixed assets (e.g., goodwill) in its approach to firm valuation as a precursor to better understanding debt and equity instruments for SMEs. In this regard, the age of the firm as well as stages of development in creditworthiness will enrich the research and allow for a more dynamic analysis of other themes at the heart of the research, namely income level, regional and sector patterns in competitiveness and SME capacity to attract financing.

The above areas for future research suggest that other independent variables can and should be incorporated into the analysis. This would make the econometric analysis more comprehensive and rigorous, particularly once time series data are available. Annex 1 provides a starting point for some potential variables that could be added (subject to issues of collinearity and multi-collinearity). Time series data would allow for an assessment of earnings, cash flow, asset value and equity variability to be assessed for more granular trend analysis. For unlisted firms, methods to establish proxy values for comparison with market-listed firms would help with the analysis. This is particularly relevant for SMEs as very few are listed in global markets.

VIII. Conclusions

A. General Conclusions

The research provides a comprehensive profile of credit access across the globe by firm size, income level and economic sector. One of the key objectives was to add to the body of knowledge on SME credit access, particularly in emerging markets. SME finance has been studied for decades, with most of the research carried out in OECD markets. The thesis aspired to add to this research by addressing emerging markets patterns as broadly as possible. This has been achieved by including more than 15,000 firms in the Level 2 sample from emerging markets, of which 6,370 are emerging markets SMEs.

As for the total Level 2 sample, 11,749 SMEs are included and account for 38% of the sample. Therefore, in terms of Level 2 sample size and specific to emerging markets, this research contributes to more general efforts by expanding the pool of firms for which financial accounting data can be used.

SME credit is a small fraction of credit value to large-scale firms. In general, the smaller the firm, the lower the level of access to credit. In some cases (i.e., Caribbean, Central Asia, Latin America), firms with annual revenues of \$2-\$5 million have more access to credit than firms in the \$5-\$10 million category. Therefore, there is not 100% positive correlation between firm size and access to finance. However, in general, medium-sized firms access credit and LTD more than small-scale firms, and large-scale firms have considerably greater access to credit than SMEs. Therefore, the response to the main research question has convincing evidence from univariate data that there is a strong firm size bias in credit allocation patterns in all markets, regions and sectors. There is also confirmation from the 2-pairwise *t*-test results which indicate there is a firm size effect in credit access. However, the regression testing and robustness tests for firm size bias and effect were less convincing. In the end, more tests supported the premise of positive correlation than rejected it. However, the test results were only narrowly skewed in favor of the premise, in 20 of 34 cases where results were accepted.

Reasons for greater access to credit by large-scale firms versus SMEs are varied and include (but are not restricted to) (1) strong financial fundamentals of large-scale firms (including IC), (2) high levels of tangible fixed assets that can be pledged as collateral, (3) greater dollar value of fees that are paid by large-scale firms to lenders, (4) levels of disclosure, as most large-scale firms in the Level 2 sample are listed firms, and (5) market power, political influence, and ability to compete.

For SMEs, many in the sample have adequate and sometimes stronger financial fundamentals than large-scale firms, but they typically lack the other qualities listed above. Their levels of TFA are lower. They use bank services less and, therefore, pay less in bank fees. Many SMEs are considered opaque. SMEs also typically have limited market power, often depend on single buyers or supply chain relationships that are driven by larger firms for certainty of sales, and often lack political influence (at least compared with the political influence wielded by large firms). Therefore, addressing these challenges is part of the solution to overcoming creditor perceptions of SME weaknesses and increasing sustainable access to credit for SMEs.

Expanding capacity of banks to increase offerings of payroll services, cash management, guarantees, credit insurance (e.g., accounts receivable on export finance transactions), and hedging and other market risk protections might serve as an inducement to SMEs to use banks for more than just deposit and loan services. Mainstreaming such services by banks for SMEs might serve as an inducement to SMEs to pay more in fees, thereby increasing prospects for building relationships that would then culminate in greater

credit access. This is particularly the case in many emerging markets where such offerings or systems are not sufficiently developed. Therefore, financial market development requirements have considerable policy implications for SME credit access from the supply side as an inducement to increase opportunities from the demand side.

B. Research Questions and Hypotheses

The thesis started with four questions. Table 89 maps questions and answers and how they relate to the relevant hypotheses. More specific components of credit decision making, pledged assets and collateral, and credit monitoring are then discussed in relation to the hypotheses.

Table 89: Summary of Hypothesis Results in Relation to Core Research Questions

Questions	Hypothesis Results
<i>Is credit access positively correlated with firm size in all markets and sectors, or are there deviations from this?</i>	<i>Univariate data, many of the regression tests and the 2-pairwise t-test support a positive response that credit access is positively correlated with firm across markets and sector. However, statistical test results were not as one-sided as expected, and earlier research showed there are periodic deviations from the pattern. Therefore, there is modest support for H1, H3, H4 and H6 that credit access is positively correlated with firm size across markets, both high-income and emerging, for listed and unlisted firms, and across sectors. This attests to the importance of other considerations not captured in the models.</i>
<i>Do tangible fixed assets that can be pledged as collateral facilitate credit access? If so, is the value of tangible fixed assets positively correlated with firm size in all markets and sectors, and therefore positively correlated with credit access in all markets and sectors?</i>	<i>Univariate data show large-scale firms have the greatest amount of TFA, and this coincides with their greater levels of credit and LTD. However, the research is unable to profile the degree of secured lending on any basis. Therefore, the question can only be answered at a high level. The research also uncovered patterns that were unexpected, such as higher levels of MOV than IMM across firm sizes (unexpected for large-scale firms), and higher levels of IMM for SMEs than expected. These findings lead to the conclusion that credit access and capacity of firms to pledge assets as collateral may be coincidental in some cases, as indicated by the univariate data for large-scale firms, while limitations for SMEs may be causal but cannot be proven from the existing data. Therefore, credit access is positively correlated with the value of tangible fixed assets that can be pledged across markets, regions and sectors. However, the research is unable to disaggregate credit patterns based on pledged assets and the degree to which these patterns apply based on firm size. Therefore, there is unproven support for H4.</i>
<i>Do legal and institutional factors play an important role in credit decision making and credit monitoring across markets and sectors?</i>	<i>Legal and institutional variables fail to demonstrate they play an important role in credit decision making and ex-post monitoring across markets and sectors. However, the broader market data on global credit allocation and scoring of individual legal and institutional variables shows there is positive correlation between net domestic credit and the legal and institutional environment. In other words, markets with strong legal and institutional environments show comparatively high levels of net domestic credit. However, there are deviations in patterns. Univariate data show large-scale firms are able to access credit and LTD, even in weak environments, while many SMEs with positive financial variables in markets with strong environments still face challenges accessing credit and LTD. Testing for the interaction of legal and institutional variables and financial variables with the dependent variables generally showed limited and mixed results. Therefore, the research is unable to determine the strength of the relationships between legal and institutional factors and dependent variables. However, the sample univariate data suggest that legal and institutional variables are important for SMEs in accessing credit, whereas they appear less important for large-scale firms. Therefore, there is only very limited support for H2, H5 and H7.</i>

How do selected financial variables compare with legal and institutional variables as independent variables in relation to dependent variables for credit access?	Financial variables show greater statistical significance than legal and institutional variables. Only four of 64 tests resulted in support for or rejection of H2, H5 or H7 (hypotheses reliant on legal and institutional variables as independent variables), whereas 30 of 64 tests resulted in support for or rejection of H1, H3, H4 or H7 (hypotheses reliant on financial variables as independent variables).
---	---

1. *Firm Size and Credit Origination Decision Making: Borrower and Lender*

The comprehensive Literature Review suggests there is a firm size bias in the capital markets, as reflected in valuations of comparatively small firms and low levels of leverage when compared with larger listed firms. Likewise, there is much research that claims “market failure” in areas of SME financing and the need for government intervention or other incentives to ensure SMEs can access finance. However, there is considerable research that indicates lending institutions are willing and able to lend to SMEs as part of their business model. This applies across the board to “stakeholder”-owned as well as “shareholder”-owned institutions, and to those that are “local” as well as larger institutions that are national, regional and global.

SME credit constraints appear to be more a function of market concentration among lending institutions. When markets are competitive, SMEs have access. When markets are concentrated, SME access may diminish, at least in some markets. However, other literature suggests that concentrated banking markets also provide underlying stability to those markets, making lending institutions more willing to lend, including to SMEs. Therefore, there is an open debate about supply side constraints and the kinds of systems that accommodate *sustainable* levels of SME finance.

Shifting to the demand side, part of the reason SMEs face constraints has to do with their own risk management and reporting systems. In the case of the former, these are often comparatively weak, underdeveloped, inadequately staffed and/or insufficiently robust in terms of information and data. All of these weaknesses translate into limitations on the quality of reporting to banks and other credit providers. An unwillingness in some cases to share or disclose information to lenders deepens creditors’ concerns about asymmetric information.

As noted above, univariate data provide considerable evidence of firm size bias in credit allocation. In general, large-scale firms access credit more readily, including LTD. This is not only due to market power and assets that can be pledged to secure loans, but also because of superior financial performance indicators. Therefore, rather than there being a bias which implies unfairness in credit allocation, the evidence suggests that credit allocation is rational based on lender returns and asset quality, key measures for real economic returns, and regulatory capital calculations. However, in regression testing, results were not as skewed or one-sided, which indicates that other factors than those captured in the models are also important.

Regulatory capital calculations partly depend on available risk mitigation instruments in the market and how this impacts concentration limits and Basel 3 capital calculations. In the high-income markets, these instruments are widely available. In emerging markets, they are less widely available from domestic institutions. However, global banks (and other financial institutions) are often able to provide credit risk, hedging and other instruments on exposures to large-scale firms irrespective of location, subject to the

ability of the client to pay for the service. This is often costly, and well beyond the capacity of SMEs to pay, which adds to the bias in the market favoring large-scale exposures to large-scale firms. (This directly relates to the point noted above that financial market development requirements in many countries has important policy implications for SME finance.)

However, concentration risk is a real problem and challenge for banks and regulators. To counter this, large-scale banks typically have diversified credit portfolios that include small business lending (as well as lending to households for housing, autos and other consumer credit) along with exposures to large-scale corporate entities, governments at different levels, and other financial institutions. Therefore, if there is a firm size bias from creditors, it appears justified. However, the research has also shown that, in some cases, SMEs not only have positive and strong financial indicators, but performance indicators that are better than those of large-scale firms. Therefore, there also appears to be an opportunity cost in the market associated with the difficulties some creditworthy SMEs face in accessing credit and LTD as a result of this firm size bias. These represent good targets for large banks seeking to improve margins, returns and yields, as well as for mid-sized banks whose capital levels and mandates are often more aligned with SME markets and financing needs.

In the end, most of the research appears to confirm firm size bias in credit access and allocation. However, test results from Sections 4-6 provide only modest support for H1, H3, H4 and H6, while weak results from legal and institutional variable testing means even less support for H2, H5 and H7. None of the hypotheses was definitively rejected. Nonetheless, the results of statistical testing lead to less support for the hypotheses than originally expected.

2. Pledged Assets, Collateral and Secured Transactions

Broadly, collateral (and guarantees) offsets some of the potential risk of credit losses should a loan go into default. While the legal framework for immovable assets (e.g., land, buildings) is reasonably well established in much of the world, this is not always the case for moveable assets like machinery and equipment. Therefore, lending is sometimes perceived to be distorted by a bias in favor of secured transactions backed by immovable properties due to weak frameworks for moveable assets. Moreover, because small firms often lack immovable assets or have low dollar values of IMM on their balance sheets, they consequently rely more on moveable assets to secure loans. These assets (machinery and equipment) typically depreciate faster than immovable assets, are subject to considerable wear and tear, and consequently generate less in the way of debt financing (and for shorter terms) when pledged as collateral.

The general concept of the usefulness of TFA as assets that can be pledged as collateral is not disputed, nor is the disproportionate share of TFA on large-scale firm balance sheets compared with SME TFA dollar values. There is a positive correlation between firm size and value of fixed assets on balance sheets. The greater the value, the greater the potential asset base to pledge for credit access.

However, the research also shows greater presence of IMM on SME balance sheets than earlier expected, and less IMM and more MOV as a share of total assets on large-scale firm balance sheets. On a relative basis as a share of total assets, there is surprising alignment in the share of immovable assets on firm-level balance sheets, which challenges underlying premises of Hypothesis 4. Even more compelling, many small-scale firms have a majority of immovable assets as a share of fixed assets, rejecting the premise that they are more dependent on moveable assets because of their limited or non-existent immovable

assets. However, this observation is partly neutralized by the relatively low absolute value of IMM assets on small-scale firm balance sheets. In the end, lenders do not always believe it is worth taking on the risk, particularly if their own creditor protection is weak due to legal and institutional weaknesses.

Based on the Level 2 sample of this research, the results show mixed support for the importance of immovable assets by firm size (positive correlation). While H4-H5 are not rejected, the testing did not provide conclusive evidence that the presence of TFA (IMM and MOV) are decisive in determining firm size effects in relation to credit access, nor was the research able to prove the importance of the legal and institutional framework as independent variables influencing firm size effects related to credit access.

3. Credit Monitoring

The research confirmed the usefulness of DEBT/EBITDA and IC as indicators for credit monitoring of loan quality and performance. While the former demonstrates the superior capacity of large-scale firms to leverage their cash flow and earnings, the latter shows the strength of their earnings (operating profits) in relation to incurred interest expense. However, the univariate data also identified that many SMEs have adequate earnings to service and repay loans. Therefore, the research suggests there are opportunity costs for many lenders by not providing credit and LTD to creditworthy SMEs.

Statistical testing did not disaggregate credit monitoring indicators in relation to firm size effect on credit access. Therefore, support for or rejection of H6-H7 was combined with results related to other hypotheses. In the case of H6, results focused on financial variables were found in responses to H1, H3 and H4. Results for H7 focused on the legal and institutional framework were found in responses to H2 and H5.

However, the Literature Review was instructive on the importance of these independent variables, particularly the financial variables used in loan covenants. Given the comparatively low interest rate environment in global markets and perennial search for yield, lenders are encouraged to look more closely at SMEs as potential borrowers to boost lender returns. A starting point in their analysis can be the use of all six of the financial variables, including the two used in credit monitoring.

Meanwhile, SMEs are encouraged to (a) develop or strengthen their enterprise risk management systems, (b) round out their management teams, (c) reduce their dependence on single buyers for goods and services, and (d) ensure the presentation of their financial accounting data synchronizes with lender internal credit risk reporting requirements. These improvements will strengthen their operational efficiency and creditworthiness and make them more attractive as borrowers to capital providers.

C. Policy Implications

General policy implications for increased SME access to finance have been referenced throughout the thesis. These include (1) improving property registration systems and asset valuation to increase the possibility of SMEs leverage TFA pledges to secure loans, (2) strengthening incentives for more robust financial and operational disclosure to creditors to reduce information opacity and creditor risks associated with asymmetric information, (3) encouraging SMEs to hedge risks through banks when their main activities are subject to high levels of price risk, (4) encouraging financial market development where it is lacking so that guarantees, credit insurance, hedging and other services offered by large-scale banks can be mainstreamed to SMEs at affordable fees, increasing their value proposition to creditors, (5) increasing SME capacity to diversify input suppliers and sources, and (6) strengthening and diversifying SME earnings sources to reduce risk concentration to single buyers. Not discussed in the thesis but added

to this list is (7) promoting business associations and SME organizations to have a stronger say in national policy development as well as to serve as information platforms and vehicles for relevant commercial information to SME members.

Other more specific policy implications from the research include (1) the need to strengthen access to working capital financing for Agriculture SMEs when they have fixed assets they can pledge (meaning they are free of encumbrances), particularly as many countries around the world are net importers of foodstuffs and are seeking to achieve food security based on greater self-sufficiency, (2) a general need in emerging markets to compensate for the risks of asymmetric information and other credit risks posed by prospective borrowers by strengthening legal and institutional frameworks; this includes strengthening moveable asset registration and valuation to enable SMEs to pledge machinery and equipment for loans, due to the prevalence of MOV as fixed assets on SME balance sheets, and (3) broader need for SMEs around the globe to strengthen enterprise and financial risk management practices in a manner that provides creditors with greater confidence in the managerial and operational skills of SMEs as well as their financial strength; financial variables typically used by lenders to monitor credit performance (i.e., DEBT/EBITDA and IC) can serve as a starting point for SMEs to develop scenarios to match with their credit needs and expectations, recognizing these two variables are likely to be included in loan covenants should a lender agree to provide the SME with financing.

D. Final Lessons of SME Credit Access in Relation to Independent Variables

On several occasions, the research has noted that lenders are missing out on some opportunities to generate greater returns by bypassing SME borrowers. Just as SMEs need to be able to communicate their creditworthiness to lenders, lenders themselves often need to realign their lending practices and risk appetite to accommodate SME financing needs.

A starting point is to assemble standard and relevant financial indicators, with which banks are universally familiar. Once established, lenders can then apply net spreads relative to the risk profile. Such a tool could then potentially culminate in more lending to SMEs, helping to address some of the potential opportunity cost that has resulted from traditional practices. These observations have policy implications for SME lending as they provide relatively easy data sets to calculate on the condition that reliable financial information is available and disclosed by prospective SME borrowers. This requires reliable accounting and valuation standards and auditing capabilities of firms. Even more importantly, as financial accounts are statements prepared by company management, this requires trustworthy management capable of producing believable financial accounts and data. Therefore, strengthening such systems in the legal and institutional framework and having incentives in place to increase the integrity of financial accounts would enhance prospects for SMEs to increase credit access.

While important, these factors alone are not sufficient, as there are many other factors that weigh on credit decision making, including supply-side factors (e.g., bank risk appetite and strategy, organizational structure of coverage of lender operations, competitive position in markets). What the research has done is provide a justification for the approach, as well as confirm why the financial independent variables are useful starting points for metrics to evaluate, and why DEBT/EBITDA and IC are useful as loan covenants.

In contrast, legal and institutional variables showed little direct relationship to credit allocation patterns. The thesis still accepts fundamental premises of institutional theory that a favorable business environment strengthens markets and leads to greater credit access. This is broadly confirmed by the

positive correlation of legal and institutional scores of high-income markets and their corresponding higher shares of global net domestic credit.

However, the results do not explain why some firms (e.g., large-scale) access credit in markets with weak indicators while other firms (e.g., some SMEs) have difficulty accessing credit and LTD when they are operating in markets with strong indicators for legal and institutional variables and, themselves, have strong financial ratios. In the end, the thesis finds that legal and institutional factors are more related to exogenous influences in the market rather than endogenous, firm-specific factors that more directly influence whether firms can access credit (and LTD). Several of these factors have been noted, such as market power, political connections, and the value of fees paid by firms to lenders for non-lending services that contributes to lenders' returns and net income. The sheer value of fees that large-scale firms pay lenders often exceeds the interest income lenders would earn from loans made to several SMEs. Moreover, SMEs often pay little in the way of fees, reducing their value as clients to lenders. These considerations are not captured in the variables but provide an explanation of what is not captured in the relationship of the independent variables to the dependent variables.

As noted in the above sections, frequency distributions of Level 2 sample firms show they are operating in markets where legal and institutional scores are strong. ("Weak" markets are those at or below the median for the seven legal and institutional variables, while "strong" markets are those above the median.) This alone serves as support for institutional theory that a strong environment enhances prospects for SME credit access. Most of the SMEs with credit in the Level 2 sample are operating in markets with strong legal and institutional environments. By contrast, SMEs in markets that are weak are relatively small as a share of the total Level 2 sample. The thesis was unable to evaluate credit patterns for the Level 1 sample of 1.2 million firms, but the assumption here is that many of these firms are SMEs that operate in markets with weak legal and institutional frameworks and lack access to credit, reinforcing the premise. By extension, large-scale firms are able to access credit even when the legal and institutional framework is weak. Therefore, institutional theory is particularly important for SME credit access, and less important or relevant for large-scale firms due to the latter's superior market power, assets, political influence, and capacity to pay fees.

In the end, the research accepts the importance of legal and institutional variables as factors in credit allocation. However, the research also found that the explanatory power of the relevant variables was weak, the data often lack statistical significance, and the coefficients showed erratic patterns. Therefore, these variables were not well suited to the model, and appear to be more relevant for higher level indicators that are more macro in nature (e.g., domestic credit as a share of GDP). By contrast, the financial variables used in the statistical testing provided sufficient results to provide partial support for the underlying premise of the research regarding firm size effects in credit access, namely that there is a positive correlation between firm size and credit access.

Annex 1: Summary of Variables from the Literature

Table 90: Summary of Variables, Relation to Research Themes, and Authors/Sources		
Variables	Calculation/Theme	Authors/Sources
Legal and Institutional		
<i>Legal System Origin</i>		Gonzalez (2013); Hernandez-Canovas et (2010)
<i>Creditor Rights</i>	Getting Credit-Creditor Legal Rights	<i>World Bank Doing Business Indicators, 2019</i> from Djankov et; Araujo et al (2012); Djankov et al (2007); Gonzalez (2013); Ge et (2012)
	Getting Credit-Creditor Information/Registries	<i>World Bank Doing Business Indicators, 2019</i> ; Behr et (2012)
	Depth of Credit Information	<i>World Bank Doing Business Indicators, 2019</i> from Djankov et (2007)
		La Porta et (1998) in Favara et (2017) and Oztekin (2015)
<i>Property Rights</i>	Property Registration	<i>World Bank Doing Business Indicators, 2019</i> ; Gonzalez (2013)
		Calomiris et (2017); Houston et (2012); Lucey et (2011)
<i>Insolvency/Bankruptcy</i>	Contract Enforcement and Insolvency Resolution	<i>World Bank Doing Business Indicators, 2019</i> ; Araujo et al (2012); Mac an Bhaird et (2016)
	Debt Enforcement	Djankov et (2008) in Favara et (2017)
<i>Regulatory Effectiveness</i>	<i>World Bank Governance Index</i> (2018 scores)	also see Houston et (2012); Mac an Bhaird et (2016)
<i>Financial System Development</i>		Rajan and Zingales (1998)
<i>Banking Sector Reform</i>	Banking Reform Index (EBRD)	Agca et, 2013; Coricelli et (2012)
<i>Accounting Transparency</i>	CIFAR	Gao et (2015); Houston et (2012)
	Strength of External Audit	Houston et (2012)
Profitability/Returns		
<i>ROA</i>	Net Income/Average Assets	Bee Abdollahi (2013); Chen (2016); Cole (2013)
	Net Income/Total Assets	Gao et (2015); Hoyt et (2011); Billett et (2016)
	EBIT/Total Assets	Cenni et (2015); Coricelli et (2012); Daskilakis et (2014, 2017)
	Operating Profits/Total Assets	Dewaelheyne et (2010); Beyhaghi et, 2017
<i>ROE</i>	Net Income/Average Equity	Gupta et (2018); Bee Abdollahi (2013)
	Net Income/Book Equity	Antonelli et (2015)
	EBIT/Book Equity	Coricelli et (2012)
<i>Return on Capital Employed</i>		Coricelli et (2012)
<i>EBITDA/Sales</i>		Bharat et (2011); Demiroglu et (2010)
Cash Flow Measures		

	EBITDA/Assets	Gupta et (2018); Bee Abdollahi (2013); Favara et (2017); Acharya et, 2011; Denis et (2014); Ge et (2012); Jha et (2015); Kim et (2017); Lin et (2018); Murfin (2012)
	EBITDA/Total Liabilities	Almamy et (2016)
<i>Operating Cash Flow</i>	OCF/Current Liabilities	Bee Abdollahi (2013)
	EBIT/Assets	Almamy et (2016); Aslan (2016); van Caneghem et, 2010; Dasilas et (2015); Filipe et (2016); Ramalho et (2009); Traczynski (2017); Ben-Nasr (2016)
	EBT/Assets	Guida et (2017)
	OCF/Assets	Chen (2016)

Earnings Margins Measures

<i>Operating Profit (Accrual) Margin</i>	OP/Capital Employed	Gupta et (2018)
	OP/Revenues (or Sales)	Gupta et (2018); Bee Abdollahi (2013)
	OP/Assets	Belkhir et (2016); Lucey et (2011)
<i>Operating Profit (non-Accrual) Margin</i>	Sales less COGS less SGA excluding R&D	Ball et (2015); Ball et (2016)
<i>Net Margin (NPRMA)</i>	Net Income/Revenues (Sales)	Gupta et (2018); Bee Abdollahi (2013); Traczynski (2017)

Working Capital/Liquidity

<i>Cash Ratio</i>	Cash and AR/Current Liabilities	Bee Abdollahi (2013)
	Cash/Current Liabilities	Tsuruta (2015)
	Cash and Marketable Securities/Current Assets	Ramalho et (2009)
	Cash Flow/Current Liabilities	Filipe et (2016)
	Cash/Total Assets	Cole (2013); Billett et (2016); Demiroglu et (2010); Denis et (2014)
<i>Current Ratio</i>	CA/CL	Rahaman (2011); Gupta (2018); Bee Abdollahi (2013); Traczynski (2017); Bharat et (2011); Demiroglu et (2010); Freudenberg et (2017); Murfin (2012); Tsuruta (2015)
<i>Quick Ratio</i>	(CA less Inventory less prepaid assets)/CL	Gupta et (2018); Bee Abdollahi (2013); Freudenberg et (2017); Murfin (2012)
<i>Financial Slack</i>	(Tangible Assets less Tangible Liabilities)-1	Rahaman (2011)
	Cash and ST Investments/Total Assets	Hoyt et (2011)
<i>Working Capital</i>	Working Capital/Total Assets	Almamy et (2016); Belkhir et (2016); Nordal et (2012); Traczynski (2017)
	Current Liabilities/Total Assets	Filipe et (2016); Joeveer (2013)
<i>Net Working Capital (Growth)</i>	Net Working Capital/Total Assets	Bee Abdollahi (2013); Cenni et (2015); Chen (2016)
	Net Working Capital/Total Sales	Ben-Nasr (2016)
	Current Liabilities/Sales	Tian et (2017)

Noncurrent Internal Financing

<i>Gross PPE</i>	Gross PPE/Total Assets	Cook et, 2016; Billett et (2016)
<i>Net PPE</i>	Net PPE/Total Assets	Belkhir et, 2016; Bharat et (2011); Ge et (2012); Kim et (2017); Lin et (2018)
<i>Tangible Assets</i>	Fixed and depreciable Assets/Total Assets	Cole (2013)
	Tangible Assets/Total Assets	Daskilakas et (2014)
<i>Tangible Fixed Assets</i>	Fixed Assets/Total Assets	Dasilas et (2015); Oztekin (2015)
<i>Shareholder Equity</i>	Shareholder Funds/Total Assets	Joeveer (2013)
	Equity/Total Liabilities	Tian et (2017)
<i>Retained Earnings</i>	Retained Earnings/Total Assets	Gupta et (2018); Almamy et (2016); Nordal et (2012); Tian et (2017); Traczynski (2017)
Hybrid Measures		
<i>Asset Structure</i>	(Net Fixed Assets + Inventories)/Total Assets	van Caneghem et, 2010
<i>Tangibility</i>	(Tangible Fixed Assets + Inventories)/Total Assets	Dewaelheyns et (2010); Ramalho et, 2009
	Net Fixed Assets/Total Assets	Gao et (2015); Lucey et (2011)
	Tangible Fixed Assets/Total Assets	Guida et, 2017
External Financing and Covenants		
<i>STD/Book Value</i>	STD/Equity	Gupta et (2018)
<i>STD/Total Assets</i>	STD/TA	Dasilas et, 2015
<i>Broad Leverage</i>	Total Liabilities/Total Assets	van Caneghem et, 2010; Coricelli et, 2012; Favara et (2017); Joeveer (2013); Traczynski (2017)
<i>Narrow Leverage</i>	Total (non-trade) Debt/Total Assets	van Caneghem et, 2010; Cole (2013); Coricelli et, 2012; Dasilas et, 2015; Guida et, 2017; Lucey et (2011); Tian et (2017); Billett et (2016); Demiroglu et (2010)
	Total Debt/(Debt + Equity)	Joeveer (2013); Murfin (2012)
<i>LTD/Total Assets</i>	LTD/TA	Rahaman (2011); Dasilas et, 2015; Guida et (2017); Hall (2012); Bharat et (2011); Ge et (2012); Kim et (2017)
<i>LTD/Total Debt</i>	LTD/TD	Favara et (2017); Gao et (2015); Hall (2012)
<i>EBITDA/Interest Expense</i>	EBITDA/Interest Expense	Gupta et (2018); Bee Abdollahi (2013); Filipe et (2016); Godlewski et (2011); Bharat et (2011); Freudenberg et (2017)
<i>Interest Coverage</i>	EBIT/Interest Expense	Cenni et (2015); Prilmeier (2017); Devos et (2012); Kim et (2017); Murfin (2012)
<i>Debt/EBITDA</i>		Prilmeier (2017); Beyhaghi et, 2017; Demiroglu et (2010); Denis et (2014); Devos et (2012); Freudenberg et (2017)
<i>Senior Debt to EBITDA</i>		Prilmeier (2017); Beyhaghi et, 2017; Freudenberg et (2017)
Leverage/Capital Structure (also see External Financing)		

<i>Total Liabilities/Tangible Assets</i>		Gupta et (2018)
<i>Total Liabilities/Total Assets</i>		Cole (2013); Dewaelheyne et (2010)
<i>Total Liabilities/Net Worth</i>		Gupta et (2018)
<i>Total Liabilities/Shareholder Equity</i>		Bee Abdollahi (2013)
<i>Capital Employed/Total Liabilities</i>		Gupta et (2018)
<i>Market/Book</i>	Tobin's Q	Aslan (2016); Chen (2016); Dasilas et (2015); Hoyt et (2011); Traczynski (2017); Bharat et (2011); Demiroglu et (2010); Denis et (2014); Devos et (2012); Freudenberg et (2017); Ge et (2014); Kim et (2017)
<i>Leverage (Growth)</i>	(STD+LTD)/(STD+LTD+Equity)	Cenni et (2015); Lin et (2018); Murfin (2012)
	(STD+ LTD)/Total Assets	Oztekin (2015)
<i>Financial Leverage</i>	Book Debt/Market Assets	Chen (2016)
	Book Liabilities/Market Equity	Hoyt et (2011)
	Debt/Tangible Net Worth	Murfin (2012)
<i>Market Leverage</i>	Total Debt/(Total Debt + Market Equity)	Gao et (2015)
	Total Debt/(Total Assets - Book Equity + Market capitalization)	Lucey et (2011)
Common Control Variables		
<i>Sales (Growth)</i>	Annual Sales (sometimes log)	Rahaman (2011); Gupta et (2018); Aslan (2016); Cenni et (2015); Cole (2013); Dasilas et (2015); Dewaelheyne et (2010); Hoyt et (2011); Ramalho et (2009); Daskilakis et (2014, 2017); Ben-Nasr (2016)
<i>Sales</i>	Sales/Total Assets	Almamy et (2016); Cole (2013); Nordal et (2012); Traczynski (2017)
<i>Earnings Growth</i>	EBIT growth (t vs. t-1)	Gupta et (2018); Andrieu et (2018); Hoyt et (2011)
<i>Assets (Growth)</i>	Total Assets (currency; log; geometric avg.)	Rahaman (2011); Aslan (2016); Belkhir et (2016); van Caneghem et, 2010; Cenni et, 2015; Cole (2013); Dewaelheyne et (2010); Favara et (2017); Gao et (2015); Guida et (2017); Hoyt et (2011); Joeveer (2013); Lucey et (2011); Nordal et (2012); Ramalho et (2009); Kim et (2017); Lin et (2018); Murfin (2012)
<i>Intangible Assets (Growth)</i>	Intangible Assets	van Caneghem et, 2010
<i>Capital Growth</i>	Capital growth (t vs. t-1)	Gupta et (2018)
<i>Employment (Growth)</i>	Head Count (sometimes log)	Rahaman (2011); Gupta et (2018); Cole (2013); Mac an Bhaird et (2016)
<i>Age</i>	natural log of # of years since incorporation	Rahaman (2011); Andrieu et 2018), van Caneghem et, 2010; Cole (2013); Dasilas et (2015); Guida et (2017)
Firm-level Governance		

<i>Board</i>	# independent directors/% of total directors	Rahaman (2011); Devos et (2012); Lin et (2018)
	# independent directors/total directors	Chen (2016); Dasilas et (2015); Devos et (2012)
	Total Board members	Dasilas et, 2015; Lin et (2018)
<i>Listed/Unlisted</i>		Cole (2013)
<i>Corporate Legal Form</i>		Cole (2013); Drakos et (2011)
<i>Enterprise Risk Management</i>		Hoyt et (2011)
<i>Shareholders</i>	Institutions/Insiders	Hoyt et (2011); Lin et (2018)
<i>Management</i>	Change in CEO	Freudenberg et (2017)
	CEO tenure, age, compensation	Lin et (2018)

Annex 2: Data Collection and Coverage

Table 91 below presents a summary of key features of how the research and data were originally structured.

Table 91: Summary of Key Data Coverage Features	
Features	Description
Purpose	To build and test a data base on issues related to SME (small- and medium-sized enterprise) creditworthiness and access to external finance.
SME Definition	SMEs are defined as active firms with between \$2 million and \$50 million in annual TOTAL OPERATING REVENUES. Firm size boundaries or quantiles are broken out as: (1) microenterprises < \$2 million in annual revenues; (2) small have \$2-\$10 million in annual revenues; (3) medium have \$10-\$50 million in annual revenues; (4) large have > \$50 million in annual revenues. Microenterprises are not addressed in this thesis and are only referenced on a cursory basis.
Geography	The thesis compares EMERGING MARKETS measures with the more economically advanced BENCHMARK countries. The research is global, covers all geographic regions, and includes 193 countries.
Units	Data are assembled on a country basis, or on a multi-country basis where batching data for countries with small economies or a relatively small number of relevant firms was more efficient time-wise. Country and multi-country data are then aggregated into geographic market regions.
Countries	Country distribution = 193, composed of EMERGING (168) plus BENCHMARK (25). See below.
Emerging Markets	The research focuses on 168 EMERGING MARKET countries = Africa (54), Caribbean (8), Central Asia (5), Asia-Pacific (27), Europe and Caucasus (24), Latin America (22), Middle East (14), and South Asia (9), and five additional small EMERGING MARKET countries that do not have companies with sufficient financial information available for detailed research but are included in more global measures and profiles.
Benchmark Countries	There are 25 BENCHMARK countries = High-income from Asia-Pacific (5), North America (2) and Europe (18).
Sectors	Sectors are based on relevant 2-digit SIC code. Financial companies are largely excluded. Therefore, banks, insurance companies, etc. are excluded from the data set as borrowers.
Ownership	All corporate entities are included to the extent possible. This includes state-owned firms and branches/affiliates of foreign companies and partnerships. However, non-profits, public authorities, and companies for which no recent financial data are available are excluded. Inactive companies are not included in the research or sample.
Main Variables	Firms are classified by (1) OPERATING REVENUES; (2) book value of TOTAL ASSETS; and (3) book value of SHAREHOLDER EQUITY. Shareholder equity is equivalent to TOTAL ASSETS less TOTAL LIABILITIES. The main variable used to segment the sample by firm size is OPERATING REVENUES.
Business Descriptive	<ul style="list-style-type: none"> • ISO Country Code for general classification purposes and, in most cases, main market of activity; • Quoted/Listed to separate firms that are listed on stock exchanges and/or are more likely to be able to float corporate bonds; • 2-digit US SIC or equivalent (e.g., NACE) for industrial classification purposes.
Time Period	Data are latest available annualized figures from most recent nine years. All firms in Level 2 sample provide data from 2014 on, with most (97%) in 2017-2018.

A. Descriptive Company Information and Geographic Classification of Market Activity

Company information includes ISO Country designation which applies to the market of activity and operations. The country of operations information is intended to provide an accurate profile of economic and commercial activity (as opposed to country of legal incorporation, which is more easily manipulated for tax or other purposes). This measure is inexact for companies that operate in more than one or two markets, as is often the case for large-scale companies. For this reason, the same global company may appear more than once in the detailed data set because of branch/affiliate/subsidiary operations. However, as data are generally unconsolidated, the risk of distortion resulting from double-counting of financial accounting data is low. For SMEs, geographic classification risks are considered low.

1. *Classification of Countries and Regions*

The research focuses on countries that are official members of the United Nations and recognized as countries. All others are included as "non-sovereign". Non-sovereign entities are insignificant to the data set and they have been excluded from the sample.²⁹ The exception to this is Taiwan, which is included in the sample, grouped along with Hong Kong and Macau as linked to China, but treated as the independent and robust economy that it is.

The data have been grouped primarily by geographic region, with some arbitrary decisions made about those groupings. North America is restricted to Canada and USA as a benchmark and does not include Mexico. Europe has been divided into two sub-groupings: one "high-income" Europe as a benchmark, and "emerging market" Europe as part of the core focus of the research on emerging markets. Asia-Pacific is also divided into two such categories and is described in greater detail below.

Latin America includes all of Central and South America apart from the exclusion of French Guyana as an overseas French territory. Mexico is included in the Latin America group, even though it is frequently classified as North American due to its membership in the USMCA (formerly NAFTA). The Dominican Republic and Cuba are included in the Latin America group as Spanish-speaking countries, even though they are in the Caribbean.³⁰

As for the Caribbean, many jurisdictions are overseas territories or equivalents and have been excluded. Bermuda and the Cayman Islands mainly serve as tax havens for companies based in other markets. Given how limited the impact is of the other countries of the region, any review of the Caribbean market should focus on Bermuda and the Cayman Islands and the role they play for companies listed in these markets. However, because they are mainly tax-oriented financial vehicles rather than "productive" entities, they are effectively excluded.³¹

The challenges are greater in the Eastern Hemisphere. The separation of "high-income" Europe from "emerging market" Europe is mainly but not entirely based on status as members of the European Union before and after major expansion began in 2004. High-income Europe includes all members prior to 2004 plus three high-income non-EU members (i.e., Iceland, Norway, Switzerland). As data apply before 2020, the UK is grouped as part of the EU. Therefore, (a) countries that were members of the EU before 2004 are included in the high-income Europe group, along with non-EU Iceland, Norway and Switzerland, whereas (b) the more recent members of the European Union and other non-EU countries from the

Balkans, Eastern Europe and the Caucasus are included as emerging market Europe. The methodology recognizes that Greece's per capita income is lower than that of the Czech Republic, Estonia and Slovenia, all of which joined the EU in 2004 as compared with Greece in 1981. However, leaving Greece in the high-income Europe group retains the historical "legacy" implication of the grouping, and does not distort the results due to Greece's relatively limited impact on total observations.

Another challenge relates to countries in the Middle East and Africa regions. Middle East countries are in Africa or in Asia. Several are in North Africa and are included as part of the Africa grouping. The rationale for the Africa grouping is to be all-inclusive on a continent-wide basis, thereby aligning with the African Development Bank list of country members. Therefore, Africa includes all countries on the continent, including those in the north that are sometimes grouped as part of the Middle East.

This leaves the remainder of non-African countries constituting the Middle East grouping. This includes Turkey, which also straddles Europe, and borders on several of the countries included in emerging market Europe. Iran is also included in this grouping, even though it borders on South Asia and the Caucasus. Israel is also included as part of the Middle East by virtue of geography.

East Asia and the Pacific region present similar issues as the European market. As such, this region was broken out into two sub-groupings: "high-income" Asia-Pacific as a benchmark that includes Australia, Japan, Korea, New Zealand and Singapore, and "emerging market" Asia-Pacific. The terminology is a misnomer, as jurisdictions like Hong Kong and Taiwan are closer to "high-income" than emerging. However, they have been left in this sub-grouping because of Hong Kong's and Taiwan's special circumstances regarding China.

Central Asia is straightforward. This grouping includes the five countries that were part of the former Soviet Union.

South Asia is also straightforward. Myanmar is included in this grouping, even though it geographically straddles southeast Asia and could have been grouped there as well. However, there is no real impact either way as the number of companies from Myanmar in the detailed sample is zero.

2. Regional Groupings

Consistent with the above, the data have been collected on a country-specific basis, and in some cases batched on a multi-country basis to constitute the relevant region. The country code in each file means that data from countries can be individualized, as well as aggregated with other groupings if/as needed.

All of the above constitutes representation in the sample from 193 countries for the general overview and profile, which includes the "gross" number of companies based on categories of firm size. The final list of countries with at least one firm supplying detailed financial information needed for the firm-level financial accounting research numbered 188.

3. Industrial Classification

The thesis relies on 2-digit SIC classifications. Industrial classification is a challenge in many cases due to (a) the diversity of activities of companies, and (b) arbitrariness of classifications. Therefore, there is recognition that the use of International Standard Industrial Classifications used by the UN or national or

regional equivalents (e.g., SIC, NAICS, NACE) is not always accurate for company profiles, or as classifiers of financial performance by sector or industry.³² Despite shortcomings, the research relies on 2-digit SIC classifications because it is the easiest system to use for large data sets that include a significant share of unlisted companies.

4. *Financial Versus Non-Financial*

As an extension of the discussion of industrial classification, a considerable number of companies that are listed on exchanges are in the financial sector. These include banks, insurance companies, diversified financial and investment companies, and others. These have been excluded from the sample. The thesis and data collection efforts were designed to restrict analysis of credit patterns to real sector firms. Therefore, the thesis does not analyze financial institutions as borrowers. However, there are financial services firms in the data set that have been included, although they are not banks, credit unions or other lenders, insurance companies, private equity firms, or other firms engaged in deposit collection, normal insurance policy underwriting or reinsurance, etc. Rather, they are considered small-scale non-deposit-taking firms mainly engaged in real estate-related businesses, insurance brokers, or other firms whose operations include support services for financial transactions without being financial intermediaries or credit suppliers. In cases where they do supply credit, the thesis assumes they are sourcing credit from larger financial sector institutions not included in the sample.

B. *Firm-Level Data*

Data retrieval largely relied on what was accessible from Orbis BvD in late 2018. The data collection occurred in three broad stages: (1) company profile information on all companies with annual revenues of \$2 million or more per country (Level 1); (2) netting out of companies that did not make detailed financial information available (Level 2); and (3) final collection of data and ratios on companies that do provide detailed financial information (Level 2). These are briefly summarized in the table below.

In the end, the more detailed financial accounting-oriented research involves an estimated 31,414 companies. Seven variables reflect the legal and institutional environment on a country basis, while other variables are descriptive and enable classifications (e.g., income level, region, SIC code for sector, listed status). The remaining variables are either financial ratios or calculations that apply to firms. This enables the analysis of firm size and credit allocation.

Table 92: Data Retrieval Steps	
Step	Data Retrieved
1	Location: Country
	Status: Active
	Legal Form/Type of Entity: Corporate (all but non-profit)
	Year of Incorporation: any time after 1800
	Industry: Non-financial
	Financial data: >\$2 million in annualized Operating Revenues
	RESULT: 3,985,115 firms in 193 countries
	SAVED: 1,201,455 firms; the number of firms in certain categories in certain countries exceeded the 18,518 firm number file limit—Australia (50,831), Brazil (770,287), China (190,864), France (66,771), Germany (35,914), Italy (82,701), Japan (137,750), Korea (64,014), Russia (80,089), Spain (51397), Sweden (22,733) and USA (468,971) have more than 2 million firms with annual sales in the \$2-\$5 million range that were not saved. Very few of these companies provide detailed financial information.
2	ORIGINALLY SPECIFIED DETAILED FINANCIAL INFORMATION: Total Current Assets, Net Stated Inventory, Net Accounts Receivable, Deferred Charges, Total Cash & Short-Term Investment, Fixed Assets, Net Property, Plant & Equipment, Net Stated Land, Net Buildings, Net Stated Plant & Machinery, Net Transportation Equipment, Intangibles, Total assets, Total Current Liabilities, Loans, Current Portion of LT Debt, Current loans & overdrafts, Trade Creditors, Income Tax Payable, Non-Current Liabilities, Total LT Interest Bearing Debt, Bank Loans, Other Long-Term Interest-Bearing Debt, Deferred Taxes, Total Liabilities and Debt, Total Shareholders' Equity, Retained Earnings, Total Liabilities and Equity, Net Debt, Enterprise Value, Number of employees, Total Revenues, Net Sales, Research & Development Expenses, EBITDA, Operating Income after Deprec. & Amort., Earnings before Interest & Tax, Earnings before Tax, Net Profit, Ordinary Dividends, Net Cash from Operating Activities, Additions to Fixed Assets, Increase/Decrease Other Long-Term Assets, Cash & Equivalents at Beginning of Year, Cash & Equivalents at End of Year Manually deleted all rows (of firms) from all files that did not include above Detailed Financial Information
3	ORIGINALLY SPECIFIED GLOBAL RATIOS: ROE using P/L before tax (%), ROCE using P/L before tax (%), ROA using P/L before tax (%), ROE using Net income (%), ROCE using Net income (%), ROA using Net income (%), Profit margin (%), Gross margin (%), EBITDA margin (%), EBIT margin (%), Cash flow/Operating revenue (%), Enterprise value/EBITDA (x), Market cap/Cash flow from operations (x), Net assets turnover (x), Interest cover (x), Stock turnover (x), Collection period (days), Credit period (days), Export revenue/Operating revenue (%), R&D expenses/Operating revenue (%), Current ratio (x), Liquidity ratio (x), Shareholders liquidity ratio (x), Solvency ratio (Asset based) (%), Solvency ratio (Liability based) (%), Gearing (%), Other Fixed Assets/Total Assets (%), Other Current Assets/Total Assets (%), Other Current Liabilities/Total Assets (%), Inventory/COGS (%), Profit per employee (th), Operating revenue per employee (th), Costs of employees/Operating revenue (%), Average cost of employee (th), Shareholders' funds per employee (th), Working capital per employee (th), Total assets per employee (th) Note: (th) = thousands of \$
	RESULT: SAVED 31,422 firms with detailed data and ratios as specified above, of which:
	Africa: 810
	Caribbean: 77
	Central Asia: 154
	Emerging Asia-Pacific: 9,235
	Emerging Europe and Caucasus: 2,192
	High-income Asia-Pacific: 6,737
	High-income Europe: 3,988
	Latin America: 1,100
	Middle East: 1,362
	South Asia: 2,391
	USA/Canada: 3,376

C. Global Profile Data

In addition to the firm-level financial data retrieved from Orbis BvD, the thesis prepared and utilized high level data on the economy for global context and perspective. These data are mainly sourced from the World Bank. The table below profiles these indicators.

Table 93: Global Data			
Data	Description	Source	Relation to Research
GDP	2017 or most recent; current US\$	World Bank	Permits estimate of credit impact and related measures within economic output measures
Domestic Credit/GDP	2017 or most recent; %	World Bank	Allows for market comparisons across all 193 countries
Domestic Credit	Calculated from above	Derived from above	Permits estimate of relevance of sample in terms of credit as a % of total for the relevant market
Population	2017 or most recent; actual	World Bank	Allows for per capita measures of credit and analysis of country size in relation to credit and enterprise patterns (e.g., scale issues)

As noted in the main text, the gross number of firms included in the sample is about 1.2 million (Level 1), while the net number of firms for which detailed financial information and ratios are available is 31,414 (Level 2). The total number of potentially accessible firms with annual revenues exceeding \$2 million is estimated at about 4 million. However, many of these firms were not saved in the sample due to technical limitations,³³ and because of the limited financial information they provide. This was validated by the net set of data of 31,414 companies, only 2.6% of the gross number of companies saved.

Notwithstanding these limitations, the overall Level 2 data set is useful in providing profile information on SMEs and national economies. The Level 2 data set of nearly 31,500 companies results in observations for SMEs and large-scale firms in 193 countries and is a comparatively large set of financial indicators.³⁴ Therefore, the profile provided in the thesis is broader in coverage than most other studies.³⁵ Table 94 below profiles sample sizes from other studies covered in the Literature Review.

Table 94: Summary of Comparatively Large Sample Sizes in Journal Articles Reviewed		
Author	No. of Firms	No. of Observations
(Calabrese & Zenga, 2010)	n/a	≈150,000 bank loan recoveries
(Cook & Tang, 2010)	n/a	>126,000
(Binsbergen et al., 2010)	n/a	126,611 firm years
(Berger et al., 2011)	n/a	13,973
(de Jong, Verbeek, & Verwijmeren, 2011)	n/a	13,338 firm years
(Behr & Sonnekalb, 2012)	n/a	55,788 loan applications
(Bena & Ondko, 2012)	24,738	n/a
(Bigelli & Sánchez-Vidal, 2012)	17,165	152,141 firm years
(Caglayan et al., 2012)	n/a	85,828 firm years
(Ferrando & Mulier, 2013)	≈ 600,000	≈ 2.5 million trade credit observations
(González, 2013a)	10,375	40,886 firm years
(Cho et al., 2014)	17,452	151,855 firm years
(Fiordelisi, Monferrà, & Sampagnaro, 2014)	43,338	n/a
(An, Li, & Yu, 2015)	19,247	n/a
(Berg & Kirschenmann, 2015)	n/a	141,316 loan applications
(Kraft & Schwartz, 2015)	15,830	104,800
(De Jonghe & Öztekin, 2015)	15,177	101,264 firm years
(An et al., 2016)	25,777	n/a
(Fernandes & Artes, 2016)	>9 million	n/a
(Filipe et al., 2016)	n/a	>2 million firm years
(Chi & Su, 2017)	10,714	>80,000 firm years
(Chiou & Shu, 2017)	1,486	17,309 firm years
(Hassan et al., 2017)	n/a	>1.7 million
(Gürtler, Hibbeln, & Usselman, 2018)	61,371 customers	≈ 2.8 million monthly observations

Annex 3: Results of Skewness and Kurtosis Testing from Original Research

This Annex addresses skewness and kurtosis testing from the original research. While the model has changed, it is relevant in terms of determining how to structure the robustness tests and address issues rooted in sample bias.

A. Skewness and Kurtosis Testing of the Original Segmented Model

The first robustness test for the previous model was for skewness and kurtosis. Given the number of statistically insignificant results, some of the model's flaws were attributed to the distributions. This has been highlighted in relation to sample bias and the presence of outliers, and how these results can skew means in particular. Therefore, additional tests were run consistent with the previous econometric specifications, but by winsorizing and trimming means to modify and eliminate the impact of outliers and to comply with skewness and kurtosis requirements. This was followed by log transformation so that model skewness and kurtosis were consistent with normally distributed samples.

For purposes of the thesis, distributions with skewness exceeding +1.00 or less than -1.00 fail the skewness test. Those that show skewness between +0.50 and +1.00 or between -0.50 and -1.00 are considered moderately skewed. Distributions between -0.50 and +0.50 are considered to be symmetric, increasingly so as skewness approaches zero.

With regard to kurtosis, data sets with high kurtosis tend to have heavy tails, or outliers. Data sets with low kurtosis tend to have light tails, or lack of outliers. Kurtosis exceeding +2.00 or -2.00 are considered to have heavy tails, or outliers, and to fail the kurtosis test. Distributions showing between +2.00 and -2.00 are considered acceptable. The closer to zero, the lower the kurtosis and, therefore, lowest potential impact of outliers.

Skewness or kurtosis results are presented in Table 95 below. Because these results indicate skewness and kurtosis in the sample, the sample is subject to winsorization, trimmed means and log transformation, as described in the subsequent subsections of the Annex.

Table 95: Skewness and Kurtosis Values for Baseline Distributions of Level 2 Sample

This table presents skewness and kurtosis values for the Level 2 sample without adjustments. Panel (1) presents general results. Panel (2) presents results by income level. Panel (3) presents results by listed status. Panel (4) presents results by sector. For all panels, Column (1) is the mean value. Column (2) is the median value. Column (3) is the standard deviation. Column (4) presents skewness. Column (5) presents kurtosis. HI = High-Income. EM = Emerging Market. Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: General Results					
	(1) Mean	(2) Median	(3) Std. Deviation	(4) Skewness	(5) Kurtosis
All Firms	1,398,271	95,734	8,353,904	21.46	752.94
Small	5,496	5,296	2,286	0.25	-1.10
Medium	27,226	25,193	10,939	0.35	-0.92
Large	2,237,175	274,147	10,509,064	17.11	477.28
Panel 2: Results by Income Level					
	(1) Mean	(2) Median	(3) Std. Deviation	(4) Skewness	(5) Kurtosis
All HI Firms	2,471,293	185,335	11,876,062	15.79	396.88
Small	5,631	5,465	2,261	0.18	-1.05
Medium	27,178	25,382	11,639	0.31	-1.10
Large	3,288,620	357,803	13,618,230	13.79	302.20
All EM Firms	515,767	53,587	3,076,482	24.35	862.49
Small	5,459	5,228	2,291	0.27	-1.11
Medium	27,251	25,071	10,575	0.38	-0.82
Large	980,584	212,478	4,230,690	17.82	458.33
Panel 3: Results by Listed Status					
	(1) Mean	(2) Median	(3) Std. Deviation	(4) Skewness	(5) Kurtosis
All LISTED Firms	1,404,139	94,817	8,517,150	21.42	740.88
Small	5,497	5,287	2,285	0.25	-1.10
Medium	27,282	25,257	10,889	0.35	-0.91
Large	2,251,275	274,150	10,727,876	17.05	468.21
All UNLISTED Firms	1,308,048	108,983	5,239,468	9.84	127.74
Small	5,485	5,369	2,296	0.30	-1.05
Medium	26,340	24,022	11,677	0.46	-0.99
Large	2,027,594	271,795	6,431,384	7.97	83.30
Panel 4: Results by Sector					
	(1) Mean	(2) Median	(3) Std. Deviation	(4) Skewness	(5) Kurtosis
All AGRICULTURE	446,703	47,230	2,695,513	13.98	223.17
Small	5,093	4,745	2,051	0.52	-0.46
Medium	27,147	25,639	10,512	0.38	-0.72
Large	901,608	196,311	3,825,137	9.80	108.81
All R&C	1,607,808	119,463	9,588,411	19.73	517.89
Small	5,537	5,365	2,299	0.16	-1.16
Medium	26,031	23,323	11,841	0.47	-1.01
Large	2,479,060	329,787	11,840,768	16.01	339.49
All MANUFACTURING	1,337,946	98,367	8,159,392	18.83	487.32
Small	5,647	5,530	2,286	0.20	-1.13
Medium	27,810	25,903	11,020	0.28	-1.00
Large	2,088,980	254,431	10,150,042	15.15	314.18
All SERVICES	1,472,117	91,963	8,492,353	24.09	1042.15
Small	5,373	5,178	2,289	0.30	-1.07
Medium	26,770	24,721	10,698	0.41	-0.80
Large	2,415,417	297,869	10,804,507	19.04	648.69

The skewness and kurtosis tests above in Table 95 indicate that values for large-scale firms are not acceptable, and that their excessive skewness and kurtosis distorts aggregate measures for all firms by income level, listed status and sector. Therefore, data sets are winsorized to moderate the impact of outliers. This is done by winsorizing at the 99%, 97.5%, 95% and 75% (upper quartile) of the distributions.

The left tail portions of the total distribution (i.e., 1%, 2.5%, 5% and 25%, respectively) are not winsorized as skewness and kurtosis measures for the SME quantiles pass tests.

However, winsorizing and trimming means at the four levels described above still fail to pass skewness and kurtosis tests in most cases. This culminates in unacceptable skewness for aggregate indicators by income, listed status and sector apart from the upper quartile for high-income markets and R&C as a sector. Table 96 presents winsorized results.

Table 96: Winsorized Skewness and Kurtosis Indicators

This table presents winsorized skewness and kurtosis values for the Level 2 sample. Panel (1) presents general results for all sample firms. Panel (2) presents results by income level. Panel (3) presents results by listed status. Panel (4) presents results by sector. For all panels, Column (1) is the number of firms in the sample for the specific category. Column (2) represents skewness and kurtosis values after winsorizing the upper quartile of the sample. Column (3) represents skewness and kurtosis values after winsorizing the upper 5% of the sample. Column (4) represents skewness and kurtosis values after winsorizing the upper 2.5% of the sample. Column (5) represents skewness and kurtosis values after winsorizing the upper 1% of the sample. HI = High-Income. EM = Emerging Market. Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
All Firms	31,414	1.18	-0.22	3.34	10.63	4.46	20.73	6.49	47.53
Panel 2: All Firms by Income Level									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
HI	14,101	0.68	-1.25	2.36	4.41	3.20	9.78	4.70	23.88
EM	17,313	1.76	1.74	5.29	30.96	7.34	63.27	11.49	164.90
Panel 3: All Firms by Listed Status									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Listed	29,473	1.18	-0.22	3.36	10.83	4.48	20.94	6.51	47.68
Unlisted	1,941	1.15	-0.29	2.96	8.11	4.11	17.97	6.23	45.26
Panel 4: All Firms by Sector									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Agriculture	599	2.04	3.11	6.27	45.25	9.03	91.65	12.31	169.26
R&C	2,509	0.96	-0.73	3.10	9.04	4.16	17.78	6.17	42.74
Manufacturing	15,092	1.23	-0.07	3.52	11.99	4.67	22.77	6.67	49.74
Services	13,194	1.14	-0.35	3.14	9.21	4.22	18.57	6.26	44.63

More specific indicators for revenue quantiles by each category show that winsorization skewness and kurtosis tests are passed for SMEs, but that large-scale enterprise indicators fail skewness tests apart from the upper quartile winsorization (55%). This applies to large-scale enterprises in high-income markets (28%) and emerging markets (90%), but only for upper quartiles. Likewise, this also applies to large-scale listed (54%) and unlisted (57%) firms, but only when winsorized at the upper quartile. By sector, large-scale firms pass skewness tests in R&C (37%), Manufacturing (64%) and Services (46%), but not in Agriculture (112%) when winsorized at 75%. All other winsorizations fail.

The results by trimmed means are worse from a skewness perspective. None of the indicators passes skewness tests at any level, as shown in Table 97 below for trimmed means.

Table 97: Trimmed Means Skewness and Kurtosis Indicators

This table presents trimmed means skewness and kurtosis values for the Level 2 sample. Panel (1) presents general results for all sample firms. Panel (2) presents results by income level. Panel (3) presents results by listed status. Panel (4) presents results by sector. For all panels, Column (1) is the number of firms in the sample for the specific category. Column (2) represents skewness and kurtosis values after trimming means for the upper quartile of the sample. Column (3) represents skewness and kurtosis values after trimming means for the upper 5% of the sample. Column (4) represents skewness and kurtosis values after trimming means for the upper 2.5% of the sample. Column (5) represents skewness and kurtosis values after trimming means for the upper 1% of the sample. HI = High-Income. EM = Emerging Market. Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
All Firms	31,414	1.79	2.76	3.76	15.73	4.76	26.32	6.35	49.41
Panel 2: All Firms by Income Level									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
HI	14,101	1.50	1.72	2.87	8.52	3.59	14.28	4.69	26.02
EM	17,313	2.07	4.02	5.17	32.10	6.92	60.17	10.41	147.66
Panel 3: All Firms by Listed Status									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Listed	29,473	1.79	2.73	3.80	16.17	4.80	26.82	6.37	49.72
Unlisted	1,941	1.78	3.09	3.22	10.74	4.17	20.29	5.98	45.01
Panel 4: All Firms by Sector									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Agriculture	599	2.06	4.00	5.71	40.70	9.85	136.11	13.12	204.57
R&C	2,509	1.57	1.75	3.44	13.13	4.53	23.33	6.22	49.12
Manufacturing	15,092	1.77	2.68	4.01	18.16	5.04	29.78	6.67	53.50
Services	13,194	1.84	3.02	3.53	13.53	4.43	22.63	5.90	43.23

The more specific indicators for revenue quantiles by each category show that trimmed means skewness and kurtosis tests are passed for SMEs, but that large-scale enterprise indicators fail all skewness tests. This applies in high-income and emerging markets, to large-scale listed and unlisted firms, and in all four sectors.

Based on the above results, even winsorized and trimmed means distributions are not considered sufficiently suitable for the model. Therefore, a log transformation was carried out to have a distribution that is normal and symmetric. This is described below.

B. Skewness and Kurtosis Results of the OPRE Log Transformation

The OPRE log transformation provides a normal distribution that meets skewness and kurtosis requirements and is reasonably symmetric. Because it is applied to the earlier unadjusted Level 2 distributions profiled above and below, this is the main model used for regressions and hypothesis testing. Table 98 below profiles skewness and kurtosis indicators by category and revenue quantile. The log transformation applies to all revenue quantile distributions and is also tested for the two dependent variables and all the independent financial variables for all three sections.

Key observations from Table 98 below profiling the OPRE log transformation include a handful of cases where skewness for large firms does not meet requirements. Large-scale emerging markets firms push the boundaries of acceptable skewness, with large-scale manufacturers and firms in the Agriculture sector failing skewness tests. Otherwise, all categories in the OPRE log transformation meet skewness and

kurtosis requirements. As these indicators are better than winsorized and trimmed means results presented above (and prior to any log transformations), the OPRE log transformation is used as the basis for the final model which log transforms all three Revenue Quantiles and also log transforms the dependent variables and six independent financial variables.

Table 98: OPRE Log Transformation Skewness and Kurtosis Indicators

This table presents skewness and kurtosis values for the Level 2 sample after log transformation. Panel (1) presents general results for all sample firms. Panel (2) presents results by income level. Panel (3) presents results by listed status. Panel (4) presents results by sector. For all panels, Column (1) is the number of firms in the sample for the specific category. Column (2) represents skewness values. Column (3) represents kurtosis values.

Panel 1: All Firms			
	(1) n	(2) Skewness	(3) Kurtosis
All Firms	31,414	0.46	0.05
Small	3,282	-0.31	-1.04
Medium	8,467	-0.29	-0.84
Large	19,385	0.97	0.52
Panel 2: All Firms by Income Level			
	(1) n	(2) Skewness	(3) Kurtosis
High-Income Markets	14,101	0.37	-0.17
Small	710	-0.43	-0.88
Medium	2,807	-0.25	-1.08
Large	10,554	0.80	-0.01
Emerging Markets	17,313	0.41	0.11
Small	2,572	-0.28	-1.07
Medium	5,660	-0.30	-0.70
Large	8,831	1.00	0.87
Panel 3: All Firms by Listed Status			
	(1) n	(2) Skewness	(3) Kurtosis
Listed	29,473	0.46	0.07
Small	3,096	-0.31	-1.04
Medium	7,970	-0.30	-0.81
Large	18,163	0.97	0.56
Unlisted	1,941	0.44	-0.22
Small	186	-0.28	-1.03
Medium	497	-0.11	-1.13
Large	1,222	0.87	-0.01
Panel 4: All Firms by Sector			
	(1) n	(2) Skewness	(3) Kurtosis
Agriculture	599	0.44	0.22
Small	101	-0.20	-0.81
Medium	206	-0.35	-0.60
Large	290	1.22	1.91
R&C	2,509	0.23	-0.17
Small	340	-0.39	-1.00
Medium	536	-0.08	-1.19
Large	1,615	0.86	0.39
Manufacturing	15,092	0.50	0.21
Small	1,393	-0.35	-0.99
Medium	4,018	-0.34	-0.82
Large	9,523	1.05	0.82
Services	13,194	0.46	-0.08
Small	1,446	-0.25	-1.11
Medium	3,698	-0.26	-0.79
Large	7,952	0.87	0.22

C. Winsorized and Trimmed Means of OPRE Log Transformation

The skewness and kurtosis indicators for the log transformation of the winsorized and trimmed means distributions meet requirements. The results are presented to indicate how the log transformation has adjusted the Level 2 distribution to one that is normally distributed. The results in Tables 99 and 100 below can be compared with the earlier winsorization and trimmed means results that did not meet skewness and kurtosis requirements.

Table 99: Winsorized Skewness and Kurtosis Indicators in OPRE Log Transformation

This table presents winsorized skewness and kurtosis values for the Level 2 sample after log transformation. Panel (1) presents general results for all sample firms. Panel (2) presents results by income level. Panel (3) presents results by listed status. Panel (4) presents results by sector. For all panels, Column (1) is the number of firms in the sample for the specific category. Column (2) represents skewness and kurtosis values after winsorizing the upper quartile of the sample. Column (3) represents skewness and kurtosis values after winsorizing the upper 5% of the sample. Column (4) represents skewness and kurtosis values after winsorizing the upper 2.5% of the sample. Column (5) represents skewness and kurtosis values after winsorizing the upper 1% of the sample. HI = High-Income. EM = Emerging Market. Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
All Firms	31,414	-0.24	-0.83	0.28	-0.42	0.36	-0.25	0.42	-0.09
Panel 2: All Firms by Income Level									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
HI	14,101	-0.52	-0.64	0.13	-0.66	0.23	-0.51	0.31	-0.35
EM	17,313	-0.01	-0.73	0.34	-0.15	0.38	-0.03	0.40	0.06
Panel 3: All Firms by Listed Status									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Listed	29,473	-0.23	-0.82	0.28	-0.41	0.36	-0.24	0.42	-0.08
Unlisted	1,941	-0.25	-0.95	0.30	-0.55	0.37	-0.40	0.42	-0.27
Panel 4: All Firms by Sector									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Agriculture	599	0.04	-0.79	0.34	-0.17	0.39	0.01	0.43	0.18
R&C	2,509	-0.42	-0.69	0.06	-0.54	0.14	-0.41	0.19	-0.29
Manufacturing	15,092	-0.23	-0.82	0.30	-0.33	0.39	-0.14	0.45	0.04
Services	13,194	-0.21	-0.89	0.30	-0.51	0.37	-0.36	0.42	-0.22

More specific indicators for revenue quantiles by each category show that winsorization skewness and kurtosis tests pass, including all large-scale enterprises. This is true by income level and listed status, and in almost all sector cases except Agriculture, which fails at the 97.5% and 99% winsorization levels for skewness only. These results differ significantly from the earlier winsorization results.

The results by trimmed means follow the same narrative, as expected. All indicators pass skewness and kurtosis requirements, including at all revenue quantile levels, apart from Agriculture at the 99% winsorization level for skewness.

Table 100: Trimmed Means Skewness and Kurtosis Indicators in OPRE Log Transformation

This table presents trimmed means skewness and kurtosis values for the Level 2 sample after log transformation. Panel (1) presents general results for all sample firms. Panel (2) presents results by income level. Panel (3) presents results by listed status. Panel (4) presents results by sector. For all panels, Column (1) is the number of firms in the sample for the specific category. Column (2) represents skewness and kurtosis values after trimming means for the upper quartile of the sample. Column (3) represents skewness and kurtosis values after trimming means for the upper 5% of the sample. Column (4) represents skewness and kurtosis values after trimming means for the upper 2.5% of the sample. Column (5) represents skewness and kurtosis values after trimming means for the upper 1% of the sample. HI = High-Income. EM = Emerging Market. Agriculture = SIC 01-09; R&C = Resources & Construction = SIC 10-17; Manufacturing = SIC 20-39; Services = SIC 40-99.

Panel 1: All Firms									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
All Firms	31,414	-0.38	-0.50	0.15	-0.46	0.26	-0.35	0.35	-0.21
Panel 2: All Firms by Income Level									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
HI	14,101	-0.59	-0.21	0.03	-0.54	0.14	-0.51	0.24	-0.42
EM	17,313	-0.21	-0.58	0.24	-0.30	0.32	-0.15	0.37	-0.03
Panel 3: All Firms by Listed Status									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Listed	29,473	-0.38	-0.49	0.15	-0.45	0.26	-0.34	0.35	-0.20
Unlisted	1,941	-0.39	-0.73	0.21	-0.55	0.30	-0.47	0.37	-0.35
Panel 4: All Firms by Sector									
	(1) n	(2) 75%		(3) 95%		(4) 97.5%		(5) 99%	
		Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Agriculture	599	-0.14	-0.84	0.24	-0.37	0.28	-0.25	0.38	0.02
R&C	2,509	-0.53	-0.29	-0.07	-0.53	0.05	-0.46	0.12	-0.38
Manufacturing	15,092	-0.40	-0.49	0.16	-0.40	0.27	-0.27	0.38	-0.09
Services	13,194	-0.33	-0.56	0.19	-0.52	0.28	-0.43	0.36	-0.32

Annex 4: Heteroscedasticity Test Results

Heteroscedasticity is a test on the residuals of a sample distribution. In the null hypothesis, the variance is constant. If the p-value is low based on the p-value t-statistic threshold (e.g., $<.05$), the null hypothesis is rejected and the alternative hypothesis is accepted that the variance is not homogeneous or constant. Therefore, the alternative hypothesis does not meet conditions of homoscedasticity that are assumed under linear regression assumptions.

The White Test for Heteroscedasticity was used to test results for heteroscedasticity of the six independent financial variables in relation to dependent variables. The White test results confirmed non-normal distributions of the Level 2 sample and baseline tests. This is not unusual for cross-sectional sample distributions with a large number of observations, and a wide range of observed values within those distributions.

The absence of homoscedasticity (equal variance) served as a motivation to carry out log transformations in the three segmented tests to compare test results observing common assumptions of linear regressions versus the baseline or unadjusted results that did not meet all of these assumptions. However, even here, conditions of homoscedasticity could not be confirmed due to the high levels of missing observations. Heteroscedasticity results are presented in the subsections below.

White Test results for the financial independent variables in relation to DEBT/ASSETS as dependent variable show high F-values that are statistically significant. In most cases, the independent values are statistically significant, apart from MOV/ASSETS. Chi-square results are statistically significant and reject the null hypothesis, indicating the model is heteroscedastic. R-square is .4971.

For results with LTD/ASSETS as the dependent variable, F-values are lower but still reasonably high and statistically significant. Four of six independent variables are statistically significant whereas EBIT/ASSETS and IMM/ASSETS are not. Chi-square results are statistically significant and reject the null hypothesis, indicating the model is heteroscedastic.

Table 101: White Test Results for Heteroscedasticity—Financial Independent Variables re DEBT/ASSETS and LTD/ASSETS

This table presents White Test results for heteroscedasticity for the dependent variables specified in the table. Independent variables are described in Table 5. Panel (1) provides the full model ANOVA summary for dependent variable DEBT/ASSETS. Panel (2) presents parameter estimates by independent variable for DEBT/ASSETS. Panel (3) presents results from Test of First and Second Moment Specification for DEBT/ASSETS. Panel (4) provides the full model ANOVA summary for dependent variable LTD/ASSETS. Panel (5) presents parameter estimates by independent variable for LTD/ASSETS. Panel (6) presents results from Test of First and Second Moment Specification for LTD/ASSETS. For panels (1) and (4), N is for total observations after accounting for the model's DF. Results are based on a full model fitted with confidence levels at 95%.

Dependent Variable: DEBT/ASSETS				
Panel 1: Full Model ANOVA Summary				
	(1) n	(2) F Value	(3) Pr > (F)	
	19,697	3,244.61	<.0001	
Panel 2: Parameter Estimates				
	(1) Parameter Estimate	(2) Standard Error	(3) t-Value	(4) Pr > (t)
EBIT/ASSETS	.25694	.00636	40.43	<.0001
NWC/ASSETS	-.49472	.00380	-130.17	<.0001
IMM/ASSETS	-.12133	.00175	-10.32	<.0001
MOV/ASSETS	.01129	.01226	0.92	.3572
DEBT/EBITDA	.00007992	.00000785	10.18	<.0001
IC	-.00031347	.00001873	-16.73	<.0001
Panel 3: Test of First and Second Moment Specification				
	(1) DF	(2) Chi-Square	(3) Pr > Chi-Square	
	27	173.72	<.0001	
Dependent Variable: LTD/ASSETS				
Panel 4: Full Model ANOVA Summary				
	(1) n	(2) F Value	(3) Pr > (F)	
	16,722	210.79	<.0001	
Panel 5: Parameter Estimates				
	(1) Parameter Estimate	(2) Standard Error	(3) t-Value	(4) Pr > (t)
EBIT/ASSETS	.00621	.00788	0.80	.4247
NWC/ASSETS	-.08839	.00449	-19.68	<.0001
IMM/ASSETS	-.00184	.01031	-0.18	.8586
MOV/ASSETS	.16470	.01063	15.50	<.0001
DEBT/EBITDA	.00007868	.00000649	12.12	<.0001
IC	-.00022978	.00001783	-12.83	<.0001
Panel 6: Test of First and Second Moment Specification				
	(1) DF	(2) Chi-Square	(3) Pr > Chi-Square	
	27	310.94	<.0001	

White Test results for the log financial independent variables in relation to log DEBT/ASSETS as dependent variable show very high F-values (27,296.1) that are statistically significant. In most cases, the independent values are statistically significant, apart from IMM/ASSETS. Chi-square results are statistically significant and reject the null hypothesis, indicating the model is heteroscedastic. R-square is a high .9283, although the significant number of missing observations means these results are interpreted with caution.

For results with LTD/ASSETS as the dependent variable, F-values are lower but still high (1,454.22) and statistically significant. Four of six independent variables are statistically significant whereas IMM/ASSETS and IC are not. Chi-square results are statistically significant and reject the null hypothesis, indicating the model is heteroscedastic. R-square is .4567.

Table 102: White Test Heteroscedasticity Results—Financial Independent Variables re logDEBT/ASSETS and logLTD/ASSETS

This table presents White Test results for heteroscedasticity for the log dependent variables specified in the table. Independent variables are described in Table 5. Panel (1) provides the full model ANOVA summary for dependent variable logDEBT/ASSETS. Panel (2) presents parameter estimates by independent variable for logDEBT/ASSETS. Panel (3) presents results from Test of First and Second Moment Specification for logDEBT/ASSETS. Panel (4) provides the full model ANOVA summary for dependent variable logLTD/ASSETS. Panel (5) presents parameter estimates by independent variable for logLTD/ASSETS. Panel (6) presents results from Test of First and Second Moment Specification for logLTD/ASSETS. For panels (1) and (4), N is for total observations after accounting for the model's DF. Results are based on a full model fitted with confidence levels at 95%.

Dependent Variable: logDEBT/ASSETS				
Panel 1: Full Model ANOVA Summary				
	(1) n	(2) F Value	(3) Pr > (F)	
	12,657	27,296.1	<.0001	
Panel 2: Parameter Estimates				
	(1) Parameter Estimate	(2) Standard Error	(3) t-Value	(4) Pr > (t)
logEBIT/ASSETS	.52761	.00399	132.37	<.0001
logNWC/ASSETS	-.03202	.00326	90.83	<.0001
logIMM/ASSETS	-.00169	.00242	-0.70	.4838
logMOV/ASSETS	.06115	.00198	30.94	<.0001
logDEBT/EBITDA	.90053	.00289	34.27	<.0001
logIC	-.01762	.00293	-6.01	<.0001
Panel 3: Test of First and Second Moment Specification				
	(1) DF	(2) Chi-Square	(3) Pr > Chi-Square	
	27	417.82	<.0001	
Dependent Variable: logLTD/ASSETS				
Panel 4: Full Model ANOVA Summary				
	(1) n	(2) F Value	(3) Pr > (F)	
	10,386	1,454.32	<.0001	
Panel 5: Parameter Estimates				
	(1) Parameter Estimate	(2) Standard Error	(3) t-Value	(4) Pr > (t)
logEBIT/ASSETS	.48546	.01545	31.43	<.0001
logNWC/ASSETS	-.09895	.01203	-8.22	<.0001
logIMM/ASSETS	-.01591	.00904	-1.76	.0784
logMOV/ASSETS	.06785	.00130	9.30	<.0001
logDEBT/EBITDA	.84695	.01193	71.01	<.0001
logIC	-.00341	.01138	-0.30	.7642
Panel 6: Test of First and Second Moment Specification				
	(1) DF	(2) Chi-Square	(3) Pr > Chi-Square	
	27	166.41	<.0001	

REFERENCES

- Acharya, V., Davydenko, S. A., Strebulaev, I. A., Agarwal, S., Hauswald, R., Ayyagari, M., ... Roland, G. (2010). Lending relationships and loan contract terms. *Review of Financial Studies*, 23(1), 1141–1203. <https://doi.org/10.1093/rfs/hhp064>
- Acharya, V. V., Amihud, Y., & Litov, L. (2011a). Creditor rights and corporate risk-taking. *Journal of Financial Economics*, 102(1), 150–166. <https://doi.org/10.1016/j.jfineco.2011.04.001>
- Acharya, V. V., Myers, S. C., & Rajan, R. G. (2011). The Internal Governance of Firms. *Journal of Finance*, 66(3), 689–720. <https://doi.org/10.1111/j.1540-6261.2011.01649.x>
- Acharya, V. V., Sundaram, R. K., & John, K. (2011). Cross-country variations in capital structures: The role of bankruptcy codes. *Journal of Financial Intermediation*, 20(1), 25–54. <https://doi.org/10.1016/j.jfi.2010.02.001>
- Acharya, V. V., Amihud, Y., & Litov, L. (2011b). Creditor rights and corporate risk-taking. *Journal of Financial Economics*, 102(1), 150–166. <https://doi.org/10.1016/j.jfineco.2011.04.001>
- Ağca, Ş., De Nicolò, G., & Detragiache, E. (2013). Banking sector reforms and corporate leverage in emerging markets. *Emerging Markets Review*, 17, 125–149. <https://doi.org/10.1016/j.ememar.2013.08.003>
- Almamy, J., Aston, J., & Ngwa, L. N. (2016). An evaluation of Altman's Z-score using cash flow ratio to predict corporate failure amid the recent financial crisis: Evidence from the UK. *Journal of Corporate Finance*, 36, 278–285. <https://doi.org/10.1016/j.jcorpfin.2015.12.009>
- Álvarez, R., & Vergara, S. (2013). Trade exposure, survival and growth of small and medium-size firms. *International Review of Economics and Finance*. <https://doi.org/10.1016/j.iref.2012.07.010>
- An, Z., Li, D., & Yu, J. (2015). Firm crash risk, information environment, and speed of leverage adjustment. *Journal of Corporate Finance*, 31, 132–151. <https://doi.org/10.1016/j.jcorpfin.2015.01.015>
- An, Z., Li, D., & Yu, J. (2016). Earnings management, capital structure, and the role of institutional environments. *Journal of Banking and Finance*, 68, 131–152. <https://doi.org/10.1016/j.jbankfin.2016.02.007>
- Andrieu, G., Staglianò, R., & van der Zwan, P. (2018). Bank debt and trade credit for SMEs in Europe: firm-, industry-, and country-level determinants. *Small Business Economics*, 51(1), 245–264. <https://doi.org/10.1007/s11187-017-9926-y>
- Antão, P., & Lacerda, A. (2011). Capital requirements under the credit risk-based framework. *Journal of Banking and Finance*, 35(6), 1380–1390. <https://doi.org/10.1016/j.jbankfin.2010.10.003>
- Antonelli, C., Crespi, F., & Scellato, G. (2015). Productivity growth persistence: firm strategies, size and system properties. *Small Business Economics*, 45(1), 129–147. <https://doi.org/10.1007/s11187-015-9644-2>
- Arena, M. P., & Dewally, M. (2012). Firm location and corporate debt. *Journal of Banking and Finance*, 36(4), 1079–1092. <https://doi.org/10.1016/j.jbankfin.2011.11.003>
- Aslan, H. (2016a). Corporate Financial Policies ? *Financial Management*, 141–173.

- Aslan, H. (2016b). Do Lending Relationships Affect Corporate Financial Policies? *Financial Management*.
- Ayyagari, M., Demirguc-kunt, A., & Maksimovic, V. (2018). in Emerging Markets ? The Role of Initial, (July). <https://doi.org/10.1093/rfs/hhx011>
- Ball, R., Gerakos, J., Linnainmaa, J. T., & Nikolaev, V. (2016a). Accruals, cash flows, and operating profitability in the cross section of stock returns. *Journal of Financial Economics*, 121(1), 28–45. <https://doi.org/10.1016/j.jfineco.2016.03.002>
- Ball, R., Gerakos, J., Linnainmaa, J. T., & Nikolaev, V. (2016b). Accruals , cash flows , and operating profitability in the cross section of stock returns R. *Journal of Financial Economics*, 121(1), 28–45. <https://doi.org/10.1016/j.jfineco.2016.03.002>
- Ball, R., Gerakos, J., Linnainmaa, J. T., & Nikolaev, V. V. (2015). Deflating profitability. *Journal of Financial Economics*, 117(2), 225–248. <https://doi.org/10.1016/j.jfineco.2015.02.004>
- Banos-Caballero, S., Garcia-Teruel, P. J., & Martinez-Solano, P. (2010). Working capital management in SMEs. *Accounting and Finance*, 50(457), 511–527. <https://doi.org/10.1111/j.1467-629X.2009.00331.x>
- Beck, T. (2013). Bank Financing for SMEs - Lessons from the Literature. *National Institute Economic Review*, 225(1), 23–38. <https://doi.org/10.1177/002795011322500105>
- Beck, T., De Jonghe, O., & Schepens, G. (2013). Bank competition and stability: Cross-country heterogeneity. *Journal of Financial Intermediation*, 22(2), 218–244. <https://doi.org/10.1016/j.jfi.2012.07.001>
- Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking and Finance*, 37(2), 433–447. <https://doi.org/10.1016/j.jbankfin.2012.09.016>
- Beck, T., Demirgüç-Kunt, A., & Pería, M. S. M. (2011). Bank Financing for SMEs: Evidence Across Countries and Bank Ownership Types. *Journal of Financial Services Research*, 39(1–2), 35–54. <https://doi.org/10.1007/s10693-010-0085-4>
- Beck, T., Lin, C., & Ma, Y. (2014). Why do firms evade taxes? The role of information sharing and financial sector outreach. *Journal of Finance*, 69(2), 763–817. <https://doi.org/10.1111/jofi.12123>
- Bee, T. S., & Abdollahi, M. (2013). Corporate Failure Prediction: Malaysia’s Emerging Market. *International Journal of Finance*, 25(4).
- Behr, P., & Sonnekalb, S. (2012). The effect of information sharing between lenders on access to credit, cost of credit, and loan performance - Evidence from a credit registry introduction. *Journal of Banking and Finance*, 36(11), 3017–3032. <https://doi.org/10.1016/j.jbankfin.2012.07.007>
- Bekaert, G., Harvey, C. R., Lundblad, C. T., & Siegel, S. (2016). Political risk and international valuation. *Journal of Corporate Finance*, 37, 1–23. <https://doi.org/10.1016/j.jcorpfin.2015.12.007>
- Belke, A. (2013). Finance Access of SMEs: What Role for the ECB? *Ruhr Economic Papers No. 430*. Retrieved from <http://www.econstor.eu/handle/10419/79253>
- Belkhir, M., Boubakri, N., & Grira, J. (2017). Political risk and the cost of capital in the MENA region. *Emerging Markets Review*, 33, 155–172. <https://doi.org/10.1016/j.ememar.2017.08.002>

- Belkhir, M., Maghyereh, A., & Awartani, B. (2016a). Institutions and corporate capital structure in the MENA region. *Emerging Markets Review*, 26, 99–129. <https://doi.org/10.1016/j.ememar.2016.01.001>
- Belkhir, M., Maghyereh, A., & Awartani, B. (2016b). Institutions and corporate capital structure in the MENA region. *Emerging Markets Review*, 26, 99–129. <https://doi.org/10.1016/j.ememar.2016.01.001>
- Ben-Nasr, H. (2016). State and foreign ownership and the value of working capital management. *Journal of Corporate Finance*, 41, 217–240. <https://doi.org/10.1016/j.jcorpfin.2016.09.002>
- Bena, J., & Ondko, P. (2012). Financial development and the allocation of external finance. *Journal of Empirical Finance*, 19(1), 1–25. <https://doi.org/10.1016/j.jempfin.2011.11.002>
- Beneish, M. D., Lee, C. M. C., & Nichols, D. C. (2013). Earnings manipulation and expected returns. *Financial Analysts Journal*, 69(2), 57–82. <https://doi.org/10.2469/faj.v69.n2.1>
- Bentzen, J., Madsen, E. S., & Smith, V. (2012). Do firms' growth rates depend on firm size? *Small Business Economics*, 39(4), 937–947. <https://doi.org/10.1007/s11187-011-9341-8>
- Berg, G., & Kirschenmann, K. (2015). Funding versus real economy shock: The impact of the 2007-09 crisis on small firms' credit availability. *Review of Finance*, 19(3), 951–990. <https://doi.org/10.1093/rof/rfu022>
- Berger, A. N., & Black, L. K. (2011). Bank size, lending technologies, and small business finance. *Journal of Banking and Finance*, 35(3), 724–735. <https://doi.org/10.1016/j.jbankfin.2010.09.004>
- Berger, A. N., Cerqueiro, G., & Penas, M. F. (2015). Market Size Structure and Small Business Lending: Are Crisis Times Different from Normal Times? *Review of Finance*, 19(5), 1965–1995. <https://doi.org/10.1093/rof/rfu042>
- Berger, A. N., Espinosa-Vega, M. A., Frame, W. S., & Miller, N. H. (2011). Why do borrowers pledge collateral? New empirical evidence on the role of asymmetric information. *Journal of Financial Intermediation*, 20(1), 55–70. <https://doi.org/10.1016/j.jfi.2010.01.001>
- Berger, A. N., Frame, W. S., & Ioannidou, V. (2016). Reexamining the empirical relation between loan risk and collateral: The roles of collateral liquidity and types. *Journal of Financial Intermediation*, 26, 28–46. <https://doi.org/10.1016/j.jfi.2015.11.002>
- Berkowitz, D., Lin, C., & Ma, Y. (2015). Do property rights matter? Evidence from a property law enactment. *Journal of Financial Economics*, 116(3), 583–593. <https://doi.org/10.1016/j.jfineco.2015.04.003>
- Berle and Means. (1932). *DCO0318_Aula_0_-_Berle__Means.pdf*. *The Modern Corporation and Private Property*.
- Beyhaghi, M., Panyagometh, K., Gottesman, A. A., & Roberts, G. S. (2017). Do Tighter Loan Covenants Signal Improved Future Corporate Results? The Case of Performance Pricing Covenants. *Financial Management*. <https://doi.org/10.1111/fima.12159>
- Bharath, S. T., Dahiya, S., Saunders, A., & Srinivasan, A. (2011). Lending Relationships and Loan Contract Terms. *Review of Financial Studies*, 24(4). <https://doi.org/10.1093/rfs/hhp064>
- Bhattacharya, U., Flores, M., Laydon, B., Liu, F., & Wu, J. (2012). What's Hot in Finance? (2008-2012).

Social Science Research Network Working Paper Series. <https://doi.org/citeulike-article-id:13251983>

- Bigelli, M., & Sánchez-Vidal, J. (2012). Cash holdings in private firms. *Journal of Banking and Finance*, 36(1), 26–35. <https://doi.org/10.1016/j.jbankfin.2011.06.004>
- Billett, M. T., Elkamhi, R., Popov, L., & Pungaliya, R. S. (2016a). Bank Skin in the Game and Loan Contract Design : Evidence from Covenant-Lite Loans, 51(3), 839–873. <https://doi.org/10.1017/S0022109016000326>
- Billett, M. T., Elkamhi, R., Popov, L., & Pungaliya, R. S. (2016b). Bank Skin in the Game and Loan Contract Design: Evidence from Covenant-Lite Loans. *Journal of Financial and Quantitative Analysis*, 51(3), 839–873. <https://doi.org/10.1017/S0022109016000326>
- Binsbergen, J. H. Van, Graham, J. R., & Yang, J. I. E. (2010). The Cost of Debt. *The Journal of Finance*, LXV(6), 2089–2136. <https://doi.org/10.1111/j.1540-6261.2010.01611.x>
- Blazy, R., Chopard, B., & Nigam, N. (2013). Building legal indexes to explain recovery rates: An analysis of the French and English bankruptcy codes. *Journal of Banking and Finance*, 37(6), 1936–1959. <https://doi.org/10.1016/j.jbankfin.2012.10.024>
- Bousslama, G. (2014). Bank ' s Organizational Characteristics and SME Lending : New Reading Through Organizational Architecture Theory. *Journal of Accounting and Finance*, 14(3), 39–52.
- Box, T., Davis, R., Hill, M., & Lawrey, C. (2018). Operating performance and aggressive trade credit policies. *Journal of Banking and Finance*, 89, 192–208. <https://doi.org/10.1016/j.jbankfin.2018.02.011>
- Brown, M., Ongena, S., & Yeşin, P. (2011). Foreign currency borrowing by small firms in the transition economies. *Journal of Financial Intermediation*, 20(3), 285–302. <https://doi.org/10.1016/j.jfi.2010.12.001>
- Büyükkarabacak, B., & Valev, N. T. (2010). The role of household and business credit in banking crises. *Journal of Banking and Finance*, 34(6), 1247–1256. <https://doi.org/10.1016/j.jbankfin.2009.11.022>
- Caglayan, M., Maioli, S., & Mateut, S. (2012). Inventories, sales uncertainty, and financial strength. *Journal of Banking and Finance*, 36(9), 2512–2521. <https://doi.org/10.1016/j.jbankfin.2012.05.006>
- Calabrese, R., & Zenga, M. (2010). Bank loan recovery rates: Measuring and nonparametric density estimation. *Journal of Banking and Finance*, 34(5), 903–911. <https://doi.org/10.1016/j.jbankfin.2009.10.001>
- Calomiris, C. W., Larrain, M., Liberti, J., & Sturgess, J. (2017a). How collateral laws shape lending and sectoral activity. *Journal of Financial Economics*, 123(1), 163–188. <https://doi.org/10.1016/j.jfineco.2016.09.005>
- Calomiris, C. W., Larrain, M., Liberti, J., & Sturgess, J. (2017b). How collateral laws shape lending and sectoral activity ☆. *Journal of Financial Economics*, 123(1), 163–188. <https://doi.org/10.1016/j.jfineco.2016.09.005>
- Campa, A. de la. (2011). *Increasing Access to Credit through Reforming Secured Transactions in the MENA Region*.
- Campello, M., & Hackbarth, D. (2012). The firm-level credit multiplier. *Journal of Financial*

- Intermediation*, 21(3), 446–472. <https://doi.org/10.1016/j.jfi.2012.02.001>
- Canales, R., & Nanda, R. (2012). A darker side to decentralized banks: Market power and credit rationing in SME lending. *Journal of Financial Economics*, 105(2), 353–366. <https://doi.org/10.1016/j.jfineco.2012.03.006>
- Caneghem, T. Van, & Campenhout, G. Van. (2012). Quantity and quality of information and SME financial structure, 341–358. <https://doi.org/10.1007/s11187-010-9306-3>
- Canton, E., Grilo, I., Monteagudo, J., & van der Zwan, P. (2013). Perceived credit constraints in the European Union. *Small Business Economics*, 41(3), 701–715. <https://doi.org/10.1007/s11187-012-9451-y>
- Carosi, A. (2016). Do local causations matter? The effect of firm location on the relations of ROE, R&D, and firm SIZE with MARKET-TO-BOOK. *Journal of Corporate Finance*, 41, 388–409. <https://doi.org/10.1016/j.jcorpfin.2016.10.008>
- Cenni, S., Monferrà, S., Salotti, V., Sangiorgi, M., & Torluccio, G. (2015). Credit rationing and relationship lending. Does firm size matter? *Journal of Banking and Finance*, 53, 249–265. <https://doi.org/10.1016/j.jbankfin.2014.12.010>
- Cerqueiro, G., Ongena, S., & Roszbach, K. (2016). Collateralization, Bank Loan Rates, and Monitoring. *Journal of Finance*, 71(3), 1295–1322. <https://doi.org/10.1111/jofi.12214>
- Chava, S., & Purnanandam, A. (2011). The effect of banking crisis on bank-dependent borrowers. *Journal of Financial Economics*, 99(1), 116–135. <https://doi.org/10.1016/j.jfineco.2010.08.006>
- Chemmanur, T. J., Krishnan, K., & Nandy, D. K. (2014). The effects of corporate spin-offs on productivity. *Journal of Corporate Finance*, 27, 72–98. <https://doi.org/10.1016/j.jcorpfin.2014.04.005>
- Chen, C., & Kieschnick, R. (2018). Bank credit and corporate working capital management. *Journal of Corporate Finance*, 48, 579–596. <https://doi.org/10.1016/j.jcorpfin.2017.12.013>
- Chen, J. Z., Lobo, G. J., Wang, Y., & Yu, L. (2013). Loan collateral and financial reporting conservatism: Chinese evidence. *Journal of Banking and Finance*, 37(12), 4989–5006. <https://doi.org/10.1016/j.jbankfin.2013.09.003>
- Chen, T. K. (2016). Does geography matter in a geographically small and culturally homogeneous country? Firm location and corporate credit risk. *International Review of Economics and Finance*. <https://doi.org/10.1016/j.iref.2016.02.007>
- Chen, Yehning, Huang, R. J., Tsai, J., & Tzeng, L. Y. (2013). Soft Information and Small Business Lending. *Journal of Financial Services Research*, 47(1), 115–133. <https://doi.org/10.1007/s10693-013-0187-x>
- Chen, Yunhao, Jiang, X., & Lee, B. (2015a). Long-Term Evidence on the Effect of Aggregate Earnings on Prices. *Financial Management*, 323–351.
- Chen, Yunhao, Jiang, X., & Lee, B. S. (2015b). Long-Term Evidence on the Effect of Aggregate Earnings on Prices. *Financial Management*. <https://doi.org/10.1111/fima.12063>
- Chi, J. D., & Su, X. (2017). The Dynamics of Performance Volatility and Firm Valuation. *Journal of Financial and Quantitative Analysis*, 52(1), 111–142. <https://doi.org/10.1017/S0022109016000788>
- Chiou, C. L., & Shu, P. G. (2017). Overvaluation and the cost of bank debt. *International Review of*

- Economics and Finance*. <https://doi.org/10.1016/j.iref.2016.12.008>
- Cho, S. S., El Ghouli, S., Guedhami, O., & Suh, J. (2014). Creditor rights and capital structure: Evidence from international data. *Journal of Corporate Finance*, 25, 40–60. <https://doi.org/10.1016/j.jcorpfin.2013.10.007>
- Chong, T. T. L., Lu, L., & Ongena, S. (2013). Does banking competition alleviate or worsen credit constraints faced by small- and medium-sized enterprises? Evidence from China. *Journal of Banking and Finance*, 37(9), 3412–3424. <https://doi.org/10.1016/j.jbankfin.2013.05.006>
- Coase, R. H. (1937). The Nature of the Firm. *Economica*, 4(16), 386–405. <https://doi.org/10.1111/j.1468-0335.1937.tb00002.x>
- Cole, R. A. (2013). What Do We Know about the Capital Structure of Privately Held US Firms? Evidence from the Surveys of Small Business Finance. *Financial Management*.
- Cook, D. O., Fu, X., & Tang, T. (2016). Are target leverage ratios stable? Investigating the impact of corporate asset restructuring. *Journal of Empirical Finance*, 35, 150–168. <https://doi.org/10.1016/j.jempfin.2015.11.003>
- Cook, D. O., & Tang, T. (2010). Macroeconomic conditions and capital structure adjustment speed. *Journal of Corporate Finance*, 16(1), 73–87. <https://doi.org/10.1016/j.jcorpfin.2009.02.003>
- Coricelli, F., Driffield, N., Pal, S., & Roland, I. (2012). When does leverage hurt productivity growth? A firm-level analysis. *Journal of International Money and Finance*, 31(6), 1674–1694. <https://doi.org/10.1016/j.jimonfin.2012.03.006>
- Crespo-espert, A. G. Æ. J. L. (2010). Credit guarantees and SME efficiency, (October 2008), 113–128. <https://doi.org/10.1007/s11187-008-9148-4>
- D’Mello, R., & Gruskin, M. (2014). Are the benefits of debt declining? The decreasing propensity of firms to be adequately levered. *Journal of Corporate Finance*, 29, 327–350. <https://doi.org/10.1016/j.jcorpfin.2014.09.008>
- Dang, C., (Frank) Li, Z., & Yang, C. (2018). Measuring firm size in empirical corporate finance. *Journal of Banking and Finance*, 86, 159–176. <https://doi.org/10.1016/j.jbankfin.2017.09.006>
- Dasilas, A., & Papasyriopoulos, N. (2015). Corporate governance, credit ratings and the capital structure of Greek SME and large listed firms. *Small Business Economics*, 45(1), 215–244. <https://doi.org/10.1007/s11187-015-9648-y>
- Daskalakis, N., Balios, D., & Dalla, V. (2017). The behaviour of SMEs’ capital structure determinants in different macroeconomic states. *Journal of Corporate Finance*, 46, 248–260. <https://doi.org/10.1016/j.jcorpfin.2017.07.005>
- Daskalakis, N., Eriotis, N., Thanou, E., & Vasiliou, D. (2014). Capital structure and size: new evidence across the broad spectrum of SMEs. *Managerial Finance*, 40(12), 1207–1222. <https://doi.org/10.1108/MF-11-2013-0325>
- Datta, S., Iskandar-Datta, M., & Sharma, V. (2011). Product market pricing power, industry concentration and analysts’ earnings forecasts. *Journal of Banking and Finance*, 35(6), 1352–1366. <https://doi.org/10.1016/j.jbankfin.2010.10.016>
- De Haas, R., Ferreira, D., & Taci, A. (2010). What determines the composition of banks’ loan portfolios?

- Evidence from transition countries. *Journal of Banking and Finance*, 34(2), 388–398. <https://doi.org/10.1016/j.jbankfin.2009.08.005>
- de Jong, A., Verbeek, M., & Verwijmeren, P. (2011). Firms' debt-equity decisions when the static tradeoff theory and the pecking order theory disagree. *Journal of Banking and Finance*, 35(5), 1303–1314. <https://doi.org/10.1016/j.jbankfin.2010.10.006>
- De Jonghe, O., & Öztekin, Ö. (2015). Bank capital management: International evidence. *Journal of Financial Intermediation*, 24(2), 154–177. <https://doi.org/10.1016/j.jfi.2014.11.005>
- De, P. K., & Nagaraj, P. (2014). Productivity and firm size in India. *Small Business Economics*, 42(4), 891–907. <https://doi.org/10.1007/s11187-013-9504-x>
- Degryse, H., Goeij, P. De, & Kappert, P. (2012). The impact of firm and industry characteristics on small firms' capital structure, 431–447. <https://doi.org/10.1007/s11187-010-9281-8>
- Demirguc-kunt, A., Laeven, L., Levine, R., Money, J., & Part, N. (2004). Regulations , Market Structure , Institutions , and the Cost of Financial Intermediation Regulations , Market Structure , Institutions , and the Cost of Financial Intermediation. *Journal of Money, Credit and Banking*, 36(3), 593–622.
- Demirgüç-Kunt, A., & Maksimovic, V. (1998). Law, Finance, and Firm Growth. *The Journal of Finance*, LIII(6).
- Demiroglu, C., & James, C. M. (2010). The information content of bank loan covenants. *Review of Financial Studies*, 23(10), 3700–3737. <https://doi.org/10.1093/rfs/hhq054>
- Denis, D. J., & Wang, J. (2014a). Debt covenant renegotiations and creditor control rights. *Journal of Financial Economics*, 113(3), 348–367. <https://doi.org/10.1016/j.jfineco.2014.04.003>
- Denis, D. J., & Wang, J. (2014b). Debt covenant renegotiations and creditor control rights \$. *Journal of Financial Economics*, 113(3), 348–367. <https://doi.org/10.1016/j.jfineco.2014.04.003>
- Devos, E., Dhillon, U., Jagannathan, M., & Krishnamurthy, S. (2012). Why are firms unlevered? *Journal of Corporate Finance*, 18(3), 664–682. <https://doi.org/10.1016/j.jcorpfin.2012.03.003>
- Dewaelheyns, N., & Hulle, C. Van. (2010). Internal Capital Markets and Capital Structure : Bank Versus Internal Debt, 16(3), 345–373. <https://doi.org/10.1111/j.1468-036X.2008.00457.x>
- Dewaelheyns, N., & Van Hulle, C. (2010). Internal capital markets and capital structure: Bank versus internal debt. *European Financial Management*, 16(3), 345–373. <https://doi.org/10.1111/j.1468-036X.2008.00457.x>
- Dichev, I., Graham, J., & Harvey, C. R. (2017). The Misrepresentation of Earnings, 22–35.
- Dichev, I., Graham, J., Harvey, C. R., & Rajgopal, S. (2016). The misrepresentation of earnings. *Financial Analysts Journal*, 72(1), 22–35. <https://doi.org/10.2469/faj.v72.n1.4>
- Dierkes, M., Erner, C., Langer, T., & Norden, L. (2013). Business credit information sharing and default risk of private firms. *Journal of Banking and Finance*, 37(8), 2867–2878. <https://doi.org/10.1016/j.jbankfin.2013.03.018>
- Dietrich, A. (2012). Explaining loan rate differentials between small and large companies: Evidence from Switzerland. *Small Business Economics*, 38(4), 481–494. <https://doi.org/10.1007/s11187-010-9273-8>

- Doblas-Madrid, A., & Minetti, R. (2013). Sharing information in the credit market: Contract-level evidence from U.S. firms. *Journal of Financial Economics*, 109(1), 198–223. <https://doi.org/10.1016/j.jfineco.2013.02.007>
- Drakos, K. (2013). Bank loan terms and conditions for Eurozone SMEs, (October 2012), 717–732. <https://doi.org/10.1007/s11187-012-9454-8>
- Drakos, K., & Giannakopoulos, N. (2011). On the determinants of credit rationing: Firm-level evidence from transition countries. *Journal of International Money and Finance*, 30(8), 1773–1790. <https://doi.org/10.1016/j.jimonfin.2011.09.004>
- Du, Q., & Shen, R. (2018). Peer performance and earnings management. *Journal of Banking and Finance*, 89, 125–137. <https://doi.org/10.1016/j.jbankfin.2018.01.017>
- Dutta, S., & Nezlobin, A. (2017). Information disclosure, firm growth, and the cost of capital. *Journal of Financial Economics*, 123(2), 415–431. <https://doi.org/10.1016/j.jfineco.2016.04.001>
- Fabbri, D., & Klapper, L. F. (2016). Bargaining power and trade credit. *Journal of Corporate Finance*, 41, 66–80. <https://doi.org/10.1016/j.jcorpfin.2016.07.001>
- Fabbri, D., Maria, A., & Menichini, C. (2010). Trade credit , collateral liquidation , and borrowing constraints \$. *Journal of Financial Economics*, 96(3), 413–432. <https://doi.org/10.1016/j.jfineco.2010.02.010>
- Fabbri, D., & Menichini, A. M. C. (2010). Trade credit, collateral liquidation, and borrowing constraints. *Journal of Financial Economics*, 96(3), 413–432. <https://doi.org/10.1016/j.jfineco.2010.02.010>
- Fabbri, D., & Menichini, A. M. C. (2016). The commitment problem of secured lending. *Journal of Financial Economics*, 120(3), 561–584. <https://doi.org/10.1016/j.jfineco.2016.02.009>
- Fama, E F. (1999). Agency Problems and the Theory of the Firm. *International Library of Critical Writings in Economics*, 103(2), 77–96.
- Fama, Eugene F, & Jensen, M. C. (1983). Separation of Ownership and Control SEPARATION OF OWNERSHIP AND CONTROL *, 26(2), 301–325.
- Farrell, M., & Gallagher, R. (2015). The Valuation Implications of Enterprise Risk Management Maturity. *Journal of Risk and Insurance*, 82(3), 625–657. <https://doi.org/10.1111/jori.12035>
- Favara, G., Morellec, E., Schroth, E., & Valta, P. (2017). Debt enforcement, investment, and risk taking across countries. *Journal of Financial Economics*, 123(1), 22–41. <https://doi.org/10.1016/j.jfineco.2016.09.002>
- Fernandes, G. B., & Artes, R. (2016). Spatial dependence in credit risk and its improvement in credit scoring. *European Journal of Operational Research*, 249(2), 517–524. <https://doi.org/10.1016/j.ejor.2015.07.013>
- Ferrando, A., & Mulier, K. (2013). Do firms use the trade credit channel to manage growth? *Journal of Banking and Finance*, 37(8), 3035–3046. <https://doi.org/10.1016/j.jbankfin.2013.02.013>
- Ferri, G., Kalmi, P., & Kerola, E. (2014). Does bank ownership affect lending behavior? Evidence from the Euro area. *Journal of Banking and Finance*, 48, 194–209. <https://doi.org/10.1016/j.jbankfin.2014.05.007>

- Filipe, S. F., Grammatikos, T., & Michala, D. (2016). Forecasting distress in European SME portfolios. *Journal of Banking and Finance*, 64, 112–135. <https://doi.org/10.1016/j.jbankfin.2015.12.007>
- Financing SMEs and Entrepreneurs, OECD*. (2018).
- Fiordelisi, F., Monferrà, S., & Sampagnaro, G. (2014). Relationship Lending and Credit Quality. *Journal of Financial Services Research*, 46(3), 295–315. <https://doi.org/10.1007/s10693-013-0176-0>
- Firth, M., Rui, O. M., & Wu, W. (2011). Cooking the books: Recipes and costs of falsified financial statements in China. *Journal of Corporate Finance*, 17(2), 371–390. <https://doi.org/10.1016/j.jcorpfin.2010.09.002>
- Fitzpatrick, J., & Ogden, J. P. (2011). The detection and dynamics of financial distress. *International Review of Finance*, 11(1), 87–121. <https://doi.org/10.1111/j.1468-2443.2010.01119.x>
- Freudenberg, F., Imbierowicz, B., Saunders, A., & Steffen, S. (2017). Covenant violations and dynamic loan contracting. *Journal of Corporate Finance*, 45, 540–565. <https://doi.org/10.1016/j.jcorpfin.2017.05.009>
- Gao, J., & Wang, J. (2017). Is Working Capital Information Useful for Financial Analysts ? Evidence from China, 1135–1151. <https://doi.org/10.1080/1540496X.2016.1278166>
- Gao, W., & Zhu, F. (2015). Information asymmetry and capital structure around the world. *Pacific Basin Finance Journal*, 32, 131–159. <https://doi.org/10.1016/j.pacfin.2015.01.005>
- Ge, W., Kim, J. B., & Song, B. Y. (2012). Internal governance, legal institutions and bank loan contracting around the world. *Journal of Corporate Finance*, 18(3), 413–432. <https://doi.org/10.1016/j.jcorpfin.2012.01.006>
- Godlewski, C. J., & Weill, L. (2011). Does Collateral Help Mitigate Adverse Selection? A Cross-Country Analysis. *Journal of Financial Services Research*, 40(1), 49–78. <https://doi.org/10.1007/s10693-010-0099-y>
- González, V. M. (2013a). Leverage and corporate performance: International evidence. *International Review of Economics and Finance*. <https://doi.org/10.1016/j.iref.2012.07.005>
- González, V. M. (2013b). Leverage and corporate performance: International evidence. *International Review of Economics and Finance*, 25, 169–184. <https://doi.org/10.1016/j.iref.2012.07.005>
- Graham, J. R., & Harvey, C. R. (1999). The theory and practice of corporate finance : Evidence from the field 1.
- Graham, J. R., Harvey, C. R., & Rajgopal, S. (2006). Value Destruction and Financial Reporting Decisions, 62(6), 27–39. <https://doi.org/10.2469/faj.v62.n6.4351>
- Gropp, R., & Guettler, A. (2018). Hidden gems and borrowers with dirty little secrets: Investment in soft information, borrower self-selection and competition. *Journal of Banking and Finance*, 87, 26–39. <https://doi.org/10.1016/j.jbankfin.2017.09.014>
- Guida, R., & Sabato, V. (2017a). Relationship Lending and Firms' Leverage: Empirical Evidence in Europe. *European Financial Management*, 23(4), 807–835. <https://doi.org/10.1111/eufm.12109>
- Guida, R., & Sabato, V. (2017b). Relationship Lending and Firms' Leverage : Empirical Evidence in Europe, 23(4), 807–835. <https://doi.org/10.1111/eufm.12109>

- Gungoraydinoglu, A., Çolak, G., & Öztekin, Ö. (2017). Political environment, financial intermediation costs, and financing patterns. *Journal of Corporate Finance*, 44, 167–192. <https://doi.org/10.1016/j.jcorpfin.2017.03.007>
- Gupta, J., Bunkanwanicha, P., Khakimov, S., & Spieser, P. (2016). Do Financial Indicators Drive Market Value of Firms in the Transition Economies? The Russian Case. *Journal of Emerging Market Finance*, 15(2), 225–268. <https://doi.org/10.1177/0972652716645894>
- Gürtler, M., Hibbeln, M. T., & Usselman, P. (2018). Exposure at default modeling – A theoretical and empirical assessment of estimation approaches and parameter choice. *Journal of Banking and Finance*, 91, 176–188. <https://doi.org/10.1016/j.jbankfin.2017.03.004>
- Hainz, C., Weill, L., & Godlewski, C. J. (2013). Bank Competition and Collateral: Theory and Evidence. *Journal of Financial Services Research*, 44(2), 131–148. <https://doi.org/10.1007/s10693-012-0141-3>
- Hall, T. W. (2012a). The collateral channel : Evidence on leverage and asset tangibility. *Journal of Corporate Finance*, 18(3), 570–583. <https://doi.org/10.1016/j.jcorpfin.2011.12.003>
- Hall, T. W. (2012b). The collateral channel: Evidence on leverage and asset tangibility. *Journal of Corporate Finance*, 18(3), 570–583. <https://doi.org/10.1016/j.jcorpfin.2011.12.003>
- Han, J. H. (2018). Does Lending by Banks and Non-banks Differ ? Evidence from Small Business Financing. *Banks and Bank Systems*. [https://doi.org/10.21511/bbs.12\(4\).2017.09](https://doi.org/10.21511/bbs.12(4).2017.09)
- Haselmann, R., Pistor, K., & Vig, V. (2010). How law affects lending. *Review of Financial Studies*, 23(2), 549–580. <https://doi.org/10.1093/rfs/hhp073>
- Hassan, F., Mauro, F., & Ottaviano, G. (2017). Banks credit and productivity growth. *ECB Working Paper Series*, 2008(2008). <https://doi.org/10.2866/584220>
- Hernández-cánovas, G., & Koëter-kant, J. (2011). i s b j SME financing in Europe : Cross-country determinants of bank loan maturity. <https://doi.org/10.1177/0266242611402569>
- Hernández-Cánovas, G., & Koëter-Kant, J. (2010). The institutional environment and the number of bank relationships: An empirical analysis of European SMEs. *Small Business Economics*, 34(4), 375–390. <https://doi.org/10.1007/s11187-008-9140-z>
- Houston, J. F., Lin, C., Lin, P., & Ma, Y. (2010). Creditor rights, information sharing, and bank risk taking. *Journal of Financial Economics*, 96(3), 485–512. <https://doi.org/10.1016/j.jfineco.2010.02.008>
- Houston, J. F., Lin, C., & Ma, Y. (2012). Regulatory Arbitrage and International Bank Flows. *Journal of Finance*, 67(5), 1845–1895. <https://doi.org/10.1111/j.1540-6261.2012.01774.x>
- Hoyt, R. E., & Liebenberg, A. P. (2011). The Value of Enterprise Risk Management. *Journal of Risk and Insurance*, 78(4), 795–822. <https://doi.org/10.1111/j.1539-6975.2011.01413.x>
- Ipinnaiye, O., Dineen, D., & Lenihan, H. (2017). Drivers of SME performance: a holistic and multivariate approach. *Small Business Economics*, 48(4), 883–911. <https://doi.org/10.1007/s11187-016-9819-5>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Jha, A., Shankar, S., & Prakash, A. (2015). Effect of bank monitoring on earnings management of the

- borrowing firm: An empirical investigation. *Journal of Financial Research*, 38(2), 219–254.
<https://doi.org/10.1111/jfir.12055>
- Jöeveer, K. (2013). What do we know about the capital structure of small firms? *Small Business Economics*, 41(2), 479–501. <https://doi.org/10.1007/s11187-012-9440-1>
- Karafiath, I. (1988). Using dummy variables in the event methodology. *The Financial Review*, 23(3).
- Kersten, R., Harms, J. O. B., Liket, K., & Maas, K. (2017). Small Firms , large Impact ? A systematic review of the SME Finance Literature. *World Development*, 97(2016), 330–348.
<https://doi.org/10.1016/j.worlddev.2017.04.012>
- Kim, D., & Sohn, W. (2017). The effect of bank capital on lending: Does liquidity matter? *Journal of Banking and Finance*, 77, 95–107. <https://doi.org/10.1016/j.jbankfin.2017.01.011>
- Kim, H. S., & Sohn, S. Y. (2010). Support vector machines for default prediction of SMEs based on technology credit. *European Journal of Operational Research*, 201(3), 838–846.
<https://doi.org/10.1016/j.ejor.2009.03.036>
- Kim, I., Miller, S., Wan, H., & Wang, B. (2016). Drivers behind the monitoring effectiveness of global institutional investors: Evidence from earnings management. *Journal of Corporate Finance*, 40, 24–46. <https://doi.org/10.1016/j.jcorpfin.2016.06.006>
- Kim, J. B., Song, B. Y., & Wang, Z. (2017). Special purpose entities and bank loan contracting. *Journal of Banking and Finance*, 74, 133–152. <https://doi.org/10.1016/j.jbankfin.2016.10.006>
- Köksal, B., & Orman, C. (2014). Determinants of capital structure: evidence from a major developing economy. *Small Business Economics*, 44(2), 255–282. <https://doi.org/10.1007/s11187-014-9597-x>
- Korteweg, A. (2010). The net benefits to leverage. *Journal of Finance*, 65(6), 2137–2170.
<https://doi.org/10.1111/j.1540-6261.2010.01612.x>
- Kraft, H., & Schwartz, E. (2015). Cash Flow Multipliers and Optimal Investment Decisions. *European Financial Management*, 21(3), 399–429. <https://doi.org/10.1111/eufm.12047>
- Krishnan, K., Nandy, D. K., & Puri, M. (2015). Does financing spur small business productivity? Evidence from a natural experiment. *Review of Financial Studies*, 28(6), 1768–1809.
<https://doi.org/10.1093/rfs/hhu087>
- Kyröläinen, P., Tan, I., & Karjalainen, P. (2013). How creditor rights affect the value of cash: A cross-country study. *Journal of Corporate Finance*, 22(1), 278–298.
<https://doi.org/10.1016/j.jcorpfin.2013.06.001>
- Liberti, J. M., & Mian, A. R. (2010). Collateral spread and financial development. *Journal of Finance*, 65(1), 147–177. <https://doi.org/10.1111/j.1540-6261.2009.01526.x>
- Lin, C. Y., Tsai, W. C., Hasan, I., & Tuan, L. Q. (2018). Private benefits of control and bank loan contracts. *Journal of Corporate Finance*, 49, 324–343. <https://doi.org/10.1016/j.jcorpfin.2018.01.006>
- Lins, K. V., Servaes, H., & Tufano, P. (2010). What drives corporate liquidity ? An international survey of cash holdings and lines of credit \$. *Journal of Financial Economics*, 98(1), 160–176.
<https://doi.org/10.1016/j.jfineco.2010.04.006>
- Love, I., Martinez Pería, M. S., & Singh, S. (2016). Collateral Registries for Movable Assets: Does Their

- Introduction Spur Firms' Access to Bank Financing? *Journal of Financial Services Research*, 49(1), 1–37. <https://doi.org/10.1007/s10693-015-0213-2>
- Lucey, B. M., & Zhang, Q. Y. (2011). Financial integration and emerging markets capital structure. *Journal of Banking and Finance*, 35(5), 1228–1238. <https://doi.org/10.1016/j.jbankfin.2010.10.017>
- mac an Bhaird, C., & Lucey, B. (2010). Determinants of capital structure in Irish SMEs. *Small Business Economics*, 35(3), 357–375. <https://doi.org/10.1007/s11187-008-9162-6>
- Mac an Bhaird, C., & Lucey, B. (2011). An empirical investigation of the financial growth lifecycle. *Journal of Small Business and Enterprise Development*, 18(4), 715–731. <https://doi.org/10.1108/14626001111179767>
- Mac an Bhaird, C., Vidal, J. S., & Lucey, B. (2016). Discouraged borrowers: Evidence for Eurozone SMEs. *Journal of International Financial Markets, Institutions and Money*, 44, 46–55. <https://doi.org/10.1016/j.intfin.2016.04.009>
- Moro, A., & Fink, M. (2013). Loan managers' trust and credit access for SMEs. *Journal of Banking and Finance*, 37(3), 927–936. <https://doi.org/10.1016/j.jbankfin.2012.10.023>
- Moro, A., Fink, M., & Maresch, D. (2015). Reduction in information asymmetry and credit access for small and medium-sized enterprises. *Journal of Financial Research*, 38(1), 121–143. <https://doi.org/10.1111/jfir.12054>
- Murfin, J. (2012). The Supply-Side Determinants of Loan Contract Strictness. *Journal of Finance*, 67(5), 1565–1601. <https://doi.org/10.1111/j.1540-6261.2012.01767.x>
- Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5(2), 147–175. [https://doi.org/10.1016/0304-405X\(77\)90015-0](https://doi.org/10.1016/0304-405X(77)90015-0)
- Myers, S. C. (1983). Stewart C. Myers. *Journal of Finance*. <https://doi.org/10.1111/j.1540-6261.1984.tb03646.x>
- Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), 187–221. [https://doi.org/10.1016/0304-405X\(84\)90023-0](https://doi.org/10.1016/0304-405X(84)90023-0)
- Ngcobo, R. N. (2018). in South Africa " CREDIT PROVISION BY BANKS : A CASE STUDY ANALYSIS OF SMALL BUSINESSES IN. [https://doi.org/10.21511/bbs.12\(4\).2017.06](https://doi.org/10.21511/bbs.12(4).2017.06)
- Niinimäki, J. P. (2011). Nominal and true cost of loan collateral. *Journal of Banking and Finance*, 35(10), 2782–2790. <https://doi.org/10.1016/j.jbankfin.2011.03.008>
- Nordal, K. B., & Næs, R. (2012). Mean Reversion in Profitability for Non-listed Firms, 18(5), 929–949. <https://doi.org/10.1111/j.1468-036X.2010.00561.x>
- Norden, L., & van Kampen, S. (2013). Corporate leverage and the collateral channel. *Journal of Banking and Finance*, 37(12), 5062–5072. <https://doi.org/10.1016/j.jbankfin.2013.09.001>
- Öztekin, Ö. (2015). Capital Structure Decisions around the World: Which Factors Are Reliably Important? *Journal of Financial and Quantitative Analysis*, 50(3), 301–323. <https://doi.org/10.1017/S0022109014000660>
- Porta, R. L. A., & Lopez-de-silanes, F. (1999). Corporate Ownership around the World Corporate

- Ownership Around the World, 54(2), 471–517.
- Prilmeier, R. (2017a). Why do loans contain covenants ? Evidence from lending relationships R, 123, 558–579. <https://doi.org/10.1016/j.jfineco.2016.12.007>
- Prilmeier, R. (2017b). Why do loans contain covenants? Evidence from lending relationships. *Journal of Financial Economics*, 123(3), 558–579. <https://doi.org/10.1016/j.jfineco.2016.12.007>
- Rahaman, M. M. (2011). Access to financing and firm growth. *Journal of Banking and Finance*, 35(3), 709–723. <https://doi.org/10.1016/j.jbankfin.2010.09.005>
- Rajan, R., & Zingales, L. (1998). Power in a theory of the firm*. *Quarterly Journal of Economics*, (May).
- Ramalho, J. J. S., & da Silva, J. V. (2009). A two-part fractional regression model for the financial leverage decisions of micro, small, medium and large firms. *Quantitative Finance*, 9(5), 621–636. <https://doi.org/10.1080/14697680802448777>
- Ramalho, J. J. S., & Vidigal, J. (2009). A two-part fractional regression model for the financial leverage decisions of micro , small , medium and large firms A two-part fractional regression model for the financial leverage decisions of micro , small , medium and large firms, 7688. <https://doi.org/10.1080/14697680802448777>
- Ramalho, J. J. S., Vidigal, J., Gupta, J., Gregoriou, A., & Ebrahimi, T. (2018). Empirical comparison of hazard models in predicting SMEs failure. *Quantitative Finance*, 18(3), 437–466. <https://doi.org/10.1080/14697688.2017.1307514>
- Rampini, A. A., & Viswanathan, S. (2013). Collateral and capital structure. *Journal of Financial Economics*, 109(2), 466–492. <https://doi.org/10.1016/j.jfineco.2013.03.002>
- Sampagnaro, G., Meles, A., & Verdoliva, V. (2015). Monitoring in small business lending: How to observe the unobservable. *Journal of Financial Research*, 38(4), 495–510. <https://doi.org/10.1111/jfir.12082>
- Santikian, L. (2014). The ties that bind: Bank relationships and small business lending. *Journal of Financial Intermediation*, 23(2), 177–213. <https://doi.org/10.1016/j.jfi.2013.11.004>
- Sengupta, R. (2014). Lending to uncreditworthy borrowers. *Journal of Financial Intermediation*, 23(1), 101–128. <https://doi.org/10.1016/j.jfi.2013.07.001>
- Shleifer, A., Easterbrook, F., Harris, M., Hellwig, M., Hines, J., Jonsson, T., ... Porta, R. La. (2012). A Survey of Corporate Governance 1., L(2), 1–43. <https://doi.org/10.1111/j.1540-6261.1997.tb04820.x>
- Shleifer and Vishny. (1997). A Survey of Corporate Governance. *The Journal of Finance*.
- Tian, S., & Yu, Y. (2017). Financial ratios and bankruptcy predictions: An international evidence. *International Review of Economics and Finance*. <https://doi.org/10.1016/j.iref.2017.07.025>
- Torre, A. De, Soledad, M., Pería, M., & Schmukler, S. L. (2010). Bank involvement with SMEs : Beyond relationship lending. *Journal of Banking and Finance*, 34(9), 2280–2293. <https://doi.org/10.1016/j.jbankfin.2010.02.014>
- Traczynski, J. (2017). *Firm Default Prediction: A Bayesian Model-Averaging Approach*. *Journal of Financial and Quantitative Analysis* (Vol. 52). <https://doi.org/10.1017/S002210901700031X>
- Uchida, H. (2011). What Do Banks Evaluate When They Screen Borrowers? Soft Information, Hard

Information and Collateral. *Journal of Financial Services Research*, 40(1), 29–48.
<https://doi.org/10.1007/s10693-010-0100-9>

Ullah, B. (2016). Bank Financing and Firm Growth : Evidence from Transition Economies Bank Financing and Firm Growth : Evidence from Transition Economies, *XL*(401), 1–49.

Van Caneghem, T., & Van Campenhout, G. (2012). Quantity and quality of information and SME financial structure. *Small Business Economics*, 39(2), 341–358. <https://doi.org/10.1007/s11187-010-9306-3>

Vander Bauwhede, H., De Meyere, M., & Van Cauwenberge, P. (2015). Financial reporting quality and the cost of debt of SMEs. *Small Business Economics*, 45(1), 149–164.
<https://doi.org/10.1007/s11187-015-9645-1>

Williamson, O. E. (2008). Transaction-Cost Economics : the Governance of Contractual Relations *, 22(2), 233–261.

Yaldiz Hanedar, E., Broccardo, E., & Bazzana, F. (2014). Collateral requirements of SMEs: The evidence from less-developed countries. *Journal of Banking and Finance*, 38(1), 106–121.
<https://doi.org/10.1016/j.jbankfin.2013.09.019>

ENDNOTES

¹ Most of the academic finance literature focuses on the much smaller number of larger and listed companies (Bhattacharya, Flores, Laydon, Liu, & Wu, 2012), estimated to be about 75,000. This thesis seeks to add to the discussion of SMEs and SME finance by (1) summarizing key corporate finance themes in the literature, (2) adapting some of these conventional finance themes and measures to SMEs, and (3) addressing whether SMEs are under-financed and, if so, whether this is justifiable from a prudent credit risk management perspective.

² Research also indicates these power dynamics exist in trade credit (Fabbri and Klapper, 2016), not just bank credit.

³ The thesis does not deal directly with the issue of intangible asset values and financing of “innovative” firms. However, some of the Level 2 aggregation in services includes such firms to the extent their annual revenues exceed \$2 million. This is not a foregone conclusion, as many start-up firms generate losses for years due to their research, testing and marketing in advance of commercialization that triggers sales, royalties or fee generation. As such, they may have considerable intangible assets on their balance sheets (e.g., goodwill), yet no revenues or revenues below \$2 million. If so, they are not captured in the thesis sample.

⁴ Given how few markets have viable venture capital and angel financing, the challenge extends to equity markets as well as unconventional financing markets. For instance, Islamic finance typically finances tangible goods and related distribution/trade, not intangible assets (Beck, Demirgüç-Kunt, et al., 2013). The issue of intangible assets and financing for knowledge-based industries and related “innovative” firms is a topic that deserves greater study, although there is already considerable literature available that deals with these themes.

⁵ The thesis does not address inactive firms, or those that have exited the market. Therefore, all firms included in the sample are active firms.

⁶ As examples of how definitions vary across the board, one study profiles differing head count thresholds across markets while also noting revenue figures used in the EU (Kersten, Harms, Liket, & Maas, 2017). Another study refers to Basel definitions and uses annual sales of up to €50 million (consistent with the EU), with small firms considered to be those with annual sales of €5 million and credit exposure of about €1 million (Antão & Lacerda, 2011). A USA-based assessment presents small firms as those with loans of less than \$100,000 (Berger et al., 2011). Another study sets an even lower threshold that classifies SME loans as any loan exceeding €10,000 (Behr & Sonnekalb, 2012).

⁷ All dollars are US dollars unless otherwise specified.

⁸ Other elements of definitions typically relate to the structure of the respective economy and/or public policy objectives to be achieved with the assistance of publicly-financed guarantees or other supports.

⁹ These businesses typically start with 100% owner financing, sometimes with the help of family and friends. As firms grow, they may then bring in minority investment, although ownership stakes remain concentrated. By the time firms are “medium-sized” they often have multiple shareholders and the original owners may be minority investors.

¹⁰ This is not restricted to SMEs. Microenterprises are typically owner-operated and/or family-owned. However, many large-scale firms are also family-owned, including listed firms (La Porta & Lopez-de-silanes, 1999; Anderson and Hamadi, 2016).

¹¹ Because many start-up businesses fail within five or so years, it takes a while for companies to become seasoned and survive on a long-term basis as a going concern.

¹² This does not mean SMEs do not engage in tax evasion. However, many if not most SMEs lack the resources to engage in legal methods of tax minimization, resulting in higher effective rates paid because larger enterprises can often hire specialists to assist with this objective. Larger firms are also more likely to be able to leverage international trade and investment transactions and engage in transfer pricing, all of which can be used to reduce tax payments.

¹³ This may be due to the weaker negotiating position they have with buyers, resulting in long receivables turnover cycles.

¹⁴ This feature has been in the literature for decades and is partly attributed to their desire to retain control (Coase, 1937; Jensen and Meckling, 1976; Fama, 1980; Cakici et al, 2015).

¹⁵ This stands in contrast to the pecking order theory, which states that firms prefer internal financing. However, these are not automatically mutually exclusive. The research suggests that even when firms prefer cash and

retained earnings to finance their businesses, they also seek out external financing. This may be for defensive purposes during periods of stress, as opposed to normal operations. Nonetheless, despite a large number of firms that “self-select” and do not apply for bank loans because they are pessimistic about their prospects, many other SMEs apply for bank credit. Likewise, even when bank credit is not available, trade credit is widely used. This is also a form of external financing.

¹⁶ Although cash management characteristics are not universal and depend on the specific SME’s effective tax rates and cash conversion cycles (Bigelli & Sánchez-Vidal, 2012).

¹⁷ For instance, USA, UK, France, Italy and Canada show SME access falls below the 25%-30% threshold. Germany does not report figures but may also fall into this category.

¹⁸ As an example, a closer look at Canada showed the OECD data at 12.5%, but other sources closer to 2%-5% for firms with \$2-\$50 million in annual revenues depending on the type of credit (e.g., lines of credit, LTD).

¹⁹ For instance, among OECD countries and others included in OECD reports, the share of SME loans to total outstanding businesses (based on the last year of reporting, typically 2016) exceeded 30% in Australia (31%), Belgium (66%), Brazil (37%), China (66%), Czech Republic (71%), Georgia (38%) Greece (55%), Hungary (68%), Ireland (58%), Israel (62%), Japan (66%), Kazakhstan (34%), Korea (79%), Latvia (78%), Malaysia (44%), New Zealand (41%), Norway (37%), Poland (56%), Portugal (82%), Slovak Republic (87%), Spain (50%), Sweden (37%), Switzerland (77%), Thailand (50%) and Turkey (32%).

²⁰ The number of firms listed on stock exchanges is estimated to be nearly 75,000 (in late 2018).

²¹ This risk is not restricted to personal considerations, such as loan decisions affecting friends and family members. There is also a major risk to governments using banking systems to finance public policy objectives that ultimately generate losses or require considerable support from public sector resources for sustainability. This can lead to crowding out and/or misallocation of lending resources that can be more productively used. This can also ultimately cause loan rates to increase if banks need to increase their margins to cover for loan losses to meet capital and other requirements.

²² Easing constraints may seem counter-intuitive, as this would mean less interest income for the lender and/or less collateral for protection against losses. However, as the borrower demonstrates creditworthiness, there will be other opportunities to borrow. Therefore, the easing of constraints increases the prospects for the lender not only retaining the borrower as a client, but also increasing income by increasing financial exposure to the borrower despite reduced rates and collateral requirements.

²³ In this regard, “local” relationships can be operationally costly, but are important in strengthening lender decision making. Geography and “distance” are relevant in determining and validating ROE, R&D, firm size and related indicators of financial, managerial and operational health (Carosi, 2016). Research has shown there is a positive correlation with local economy effects for lenders and borrowers resulting from lending relationships, therefore making them relevant for better functioning credit scoring models (Fernandes & Artes, 2016). Geography and “local” orientation are also considered to help reduce the cost of information collection, such as in urban versus rural areas (Arena & Dewally, 2012).

²⁴ The financial services industry is a heavy user of information technologies and is now a major driver in the use of “Big Data” and data analytics, blockchain development, and “fin-tech”. More than one bank executive has referred to modern banking business models as technology companies in the business of finance. While this may be particularly true for the largest (global and domestic) systematically important financial institutions, the use of modern technology has increased exponentially across financial systems globally in recent decades.

²⁵ The reason why the Level 1 sample was not expanded to included these firms was twofold: (1) it would have made data processing far more challenging due to the size of the sample; and (2) only a microscopic share of the Level 1 firms present financial accounting data apart from very high level data like revenues and assets. Therefore, data analysis from useful and relevant financial accounting information would not have been possible.

²⁶ This means that many emerging market banking systems (and others) include gems, jewelry and gold as liquid assets, as these are often the main collateral households and small businesses have to pledge for a loan. This is more typical in housing and consumer finance, and less prominent in business finance.

²⁷ Earnings management is a persistent weakness in markets at all levels that reflects challenges in the quality of accounting information, accruals management, and the impact these have on projected earnings and company performance (Du & Shen, 2018). A recent survey indicates that earnings management affects 20% of firms and 10% of earnings in US markets (Dichev et al., 2016). This is not a recent development, but a longstanding trend (Graham, Harvey, & Rajgopal, 2006).

²⁸ Liquidity measures are typically included as covenants in loan agreements, but with much less frequency than the covenants selected in the equation (Prilmeier, 2017). Liquidity covenants such as current or quick ratios focus on how the borrower manages cash and short-term assets to ensure adequate funds are available to meet interest and loan principal obligations. Such borrower cash or retained earnings are typically generated from operating profits and EBITDA. Therefore, no liquidity measures are included in the equation as this would be partly redundant.

²⁹ In other words, (1) the data from UK overseas territories like Anguilla, Bermuda, Montserrat and UK Virgin Islands are not commingled with the UK data, (2) French Guyana, Martinique and Guadeloupe are not commingled with France, and (3) the US Virgin Islands and Puerto Rico are not commingled with the USA data. Many small jurisdictions have been excluded because they are non-sovereign and/or tax havens where companies have little to no output apart from some legal, financial, administrative, tax or other activity. For purposes of the research, they have generally been excluded to reduce potential distortions to the data. The list of excluded jurisdictions includes American Samoa, Andorra, Aruba, Bermuda, Cayman Islands, Channel Islands, Curacao, Faroe Islands, French Polynesia, Greenland, Guam, Isle of Man, Liechtenstein, Monaco, New Caledonia, Northern Mariana Islands, Puerto Rico, San Marino, Sint Maarten/St. Martin, Turks and Caicos Islands, US Virgin Islands, and West Bank and Gaza.

³⁰ In the case of Cuba, there is little information and data, so there is little effect. For instance, Cuba is not included in the sample of 187 countries on which the World Bank *Doing Business Indicators* are based.

³¹ The Caribbean is complicated by the presence of sub-sovereign “overseas territories”. On the one hand, they can be included as a part of any OECD-oriented analysis and consolidated with their respective “home” countries (i.e., French Guyana with France, Bermuda, Cayman Islands and Virgin Islands with UK, Netherlands Antilles with the Netherlands, and Puerto Rico and the Virgin Islands with the USA), rather than in the emerging market analysis. The reason for this is premised on underlying ownership of most of the assets associated with these markets. As these entities are not sovereign, their values can be logically pooled with “home” country values. In the end, they were excluded because so much of their activity is focused on tax-oriented behavior by foreign companies, and because of their non-sovereign status.

³² This has been documented elsewhere and has resulted in alternative classification systems such as the Global Industrial Classification System.

³³ Each file was limited to 18,518 firms. Therefore, when specific segments of the market exceeded this number, they were either further disaggregated, or simply not saved. For instance, Brazil has more than 900,000 firms with annual sales between \$2-\$10 million. In the end, a large number of small firms were not saved because very few provide any detailed financial accounting information.

³⁴ As an example of what is possibly the largest publicly accessible data set, the World Bank Enterprise Survey covers approximately 135,000 firms in 139 countries.

³⁵ Some other articles that were not included in the Literature Review also had large samples based on number of firms and/or observations.