The Impact of the Financial Crisis on the Working Capital of SMEs: A Panel Data Analysis

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Declaration

I hereby certify that this material, which I now submit on the programme of study leading to the award of Doctor of Philosophy is entirely my own work, and that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my own work.

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ID No.: 11212616

Date:

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Table of Contents

List of Equations

List of Tables

List of Figures

List of Abbreviations

ADRI	Anti Director Rights Index
Amadeus	Analyse Major Database from European Union Sources
BDV	Bureau Van
BIS	Department of Business, Innovation and Skills
CGS	Credit Guarantee Schemes
Cov	Covariance
CRO	Central Registration Office
CSO	Central Statistics Office
DCU	Dublin City University
EC	European Commission
ECB	European Central Bank
EIM	Enterprise Industry and Management
FAME	Financial Analysis Made Easy
FE	Fixed Effects
FST	Financial Strength
GDP	Grosss Domestic Product
GDPpcg	Gross Domestic Product Per Capita Growth
GMM	Generalised Method of Moments
GVA	Gross Value Added
H	Hypothesis
ICRG	International Country Rules Guide
IEA	Irish Economics Association
IIF	Institute of International Finance
INFINITI	International Financial Integration Conference
ISME	Irish Small and Medium Enterprises Association
LLSV	La Porta, Lopez-de-Silanes, Shleifer and Vishney
NDTS	Non Debt Tax Shields
NESC	National Economic and Social Council
Net TC	Net Trade Credit
NTBFs	New Technology based Firms
NUIG	National University of Ireland, Galway
NUIM	National University of Ireland, Maynooth
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
PFN	Portuguese Finance Network
POT	Pecking Order Theory
RE	Random Effects
SABI	Comprehensive data on Spanish and Portuguese Companies
SAFE	Survey on Access to Finance for Enterprises
SBCI	Strategic Banking Corporation Ireland
SMEs	Small and Medium Sized Enterprises
STATA	Statistical data software
STOT	Static Trade off Theory
TCD	Trinity College Dublin
UCD	University College Dublin
VIF	Variance Inflation Factors
WBGI	World Bank Governance Indicators
WCR	Working Capital Ratio

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Abstract

The thesis examines the financing behaviour of Small and Medium sized Enterprises (SMEs) over the business cycle, focusing on the impact of the 2008 financial crisis, using panel data analysis. The analysis is presented in three studies. Study 1 is a position paper which compares the effectiveness of pecking order theory with the trade-off theory in explaining the changes in SME capital structure over the crisis, using a sample of Irish and UK companies. The findings indicate a significant deleveraging in SMEs in the immediate aftermath of the financial crisis, using a modified flow of funds methodology. Given the declining role of debt, Study 2 examines the role of trade credit in the adjustment process in the sector via redistribution and substitution effects, in a panel of over 7600 SMEs in Ireland, over the period 2003 to 2011. While there was a net reduction in trade credit in the sector in the aftermath of the banking crisis, the findings show that financially weaker firms received significantly more finance in the form of trade credit coinciding with the dramatic reduction of bank credit extended to the private non-financial sector. In terms of a redistribution effect; financially stronger firms extended relatively more trade credit to financially weaker SMEs, and most likely on an involuntary basis. Finally, using an extensive panel of over 280,000 SMEs across 15 European countries, Study 3 confirms the domestic results in a cross country context and shows that trade credit has played a pivotal role in the financing of financially weaker SMEs over the crisis. Firms with the greatest level of cash reserves became net financiers of credit. The results also show the relation between trade credit and SME survival as well as the role of institutional and country level factors in explaining trade credit use.

Chapter 1: Introduction

1.1 Introduction

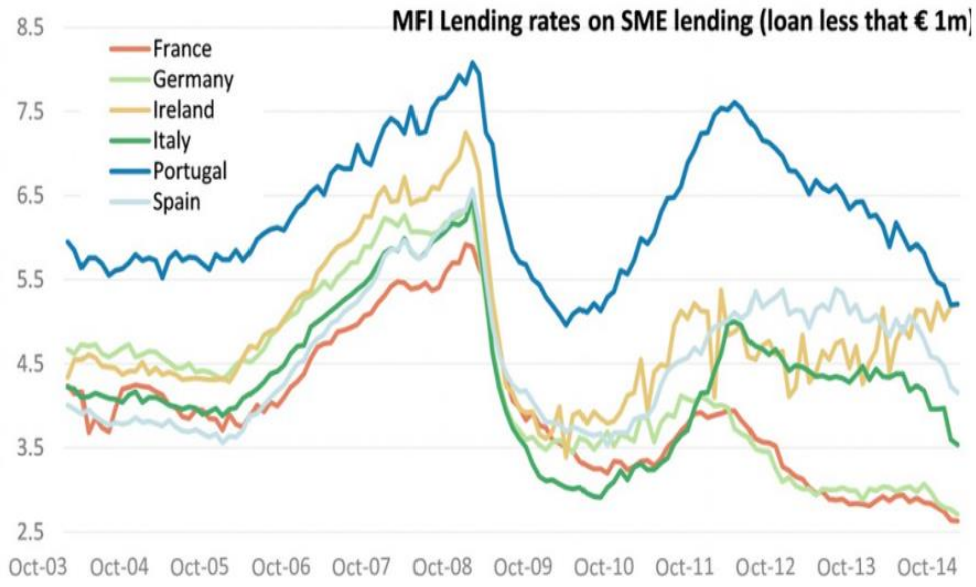
Few would dispute the importance of the SME sector in developed economies, for output growth, employment creation and sustainability (OECD, 2006; EIM Business and Policy Research Report, 2011). According to the European Commission (2005) SME criteria, SMEs are defined as enterprises which employ less than 249 workers in a given year and have either an annual turnover of less than €50m or a balance sheet total of less than €43m. This group is further divided into three separate groups based on employee numbers, annual turnover and level of assets[1]. Within the European Union alone, it is estimated that SMEs provide two out of every three jobs and account for more than 58 percent of gross value added (IIF Bain and Company, 2013). However, the period since 2008 has proved to be very challenging for SMEs with an estimated 1.5 million SME jobs lost across the EU 27 countries between 2008 and 2010 (European Commission, 2013). For these reasons, the viability and sustainability of SMEs in the aftermath of the financial crisis has been at the forefront of public debate.

A major factor in the growth and sustainability of SMEs is access to finance (European Commission, 2008). While, decreased access to funds by banks throughout the crisis has restricted lending and impacted on firms of all sizes, the impact of decreased lending has been most visible in the SME sector. Since

[1] . Micro enterprises employ less than 10 employees annually and have an annual turnover of less than €2m. Small firms are defined as employing between 10 and 49 employees with an annual turnover of between €2m and €10m, while Medium sized enterprises employ between 50 and 249 each year and have annual turnover of less than €50m and a balance sheet total of less than €43m. See http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm [Accessed 02.05.2012].

2008, SMEs across Europe have been adversely affected by dramatic reductions in both aggregate demand and bank lending, upon which most SMEs are heavily reliant. According to European Commission data, since 2008, loans of less than €1 million to SMEs have declined by an average of 47 percent since the pre-crisis peaks, with falls in the region of 66 percent in Spain and 82 percent in Ireland. The following figure illustrates the severity of the banking crisis on lending to SMEs since 2008.

Figure 1.1. Lending to SMEs (< €1m) across Europe



Source : ECB , Morgan Stanley Research. Data as at October 2014

Understanding the decision making process in SMEs under financial constraints and economic contraction is crucial for informing policy makers and improving our understanding of the SME sector. While research to date has focused on the supply of bank finance to the sector in the aftermath of the financial crisis, this research considers the hitherto unexamined role of trade credit in the adjustment process within the sector in Ireland and across several European countries. The

research focuses in particular on the financing behaviour of SMEs in the aftermath of the 2008-2009 financial crises.

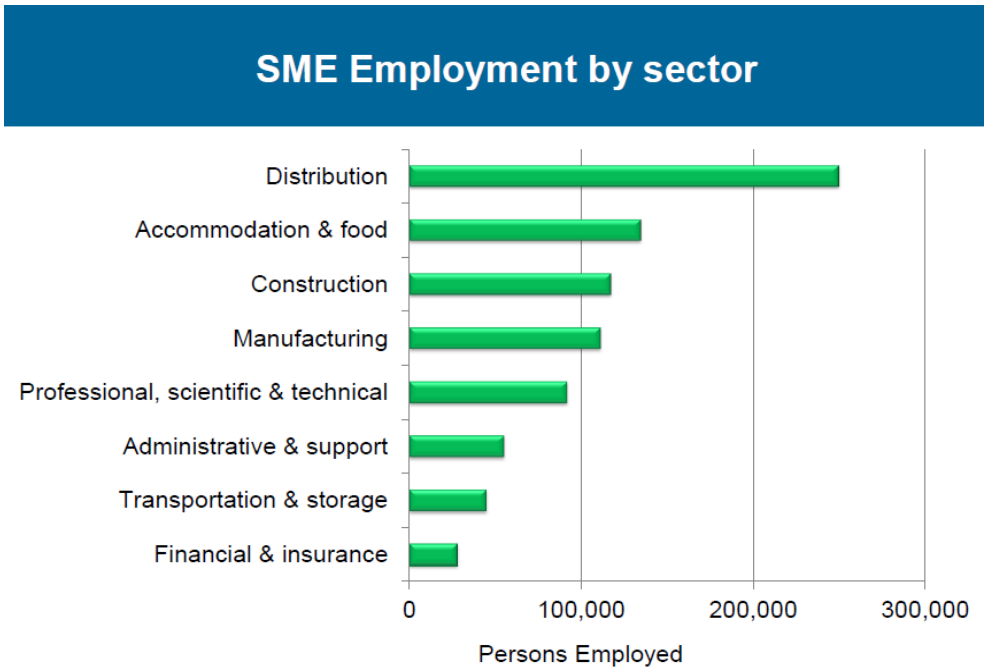
In Ireland, prior to the crisis of 2008, research and data on SME financing was sparse. This observed lack of research was highlighted in a number of reports in the 1980's and 90's (NESC, 1983, 1984, Kinsella, Story, Mulvenna and Coyne, 1994). Since 2008, however, there has been a growth in the number of state agencies and institutions publishing research on SME finance. In line with the work of the European Central Bank, the Irish Central Bank has increased the level of designated research on SME finance. Similarly, other banks and economic institutions including, the Central Statistics Office (C.S.O), Forfás, Economic and Social Research Institute, Inter-Trade Ireland, Department of Finance have all increased the level of research on the SME sector. In addition to this growing level of research, there has been the introduction of new surveys on the topic of access to finance for SMEs. These surveys include the Red C Credit Demand Survey by the Department of Finance[2]. Non Government agencies including the Small Firms Association, Mazars Ireland, the Irish Small and Medium Enterprises Association (ISME) have also conducted similar research on access to finance for SMEs and lobbied on behalf of SMEs in Ireland.

It is estimated that SMEs in Ireland account for approximately 99 percent of all enterprises, three quarters of all private sector employment and approximately half of the economy Gross Value Added (C.S.0. data). While composition of the sector has changed since the crisis, a significant proportion of the

[2] http://www.finance.gov.ie/sites/default/files/Dept%20of%20Finance%20SME%20Credit%20Demand%20Survey%20Report%20-%20Apr-Sep%202013.pdf

employment created by SMEs is in the distribution, accommodation and food, construction and manufacturing sectors. Figure 1.2 below shows the composition of SMEs in Ireland in 2012.

Figure1.2 SME employment by sector in Ireland



Source: Central statistics office Ireland

The SME sector is also found to be quite a dynamic sector, with over 50% of SMEs reported active between the years of 2001 and 2010 were less than 10 years in age (C.S.0. data). It is also noted that on average 18% of SMEs in a given year are comprised of new entrants and exits (CRO, 2013).

Since the year 2000, the composition of new lending and stocks of the finance outstanding has been analysed (see Menton and Sherman, 2014; Kelly and Everett, 2004). Official Central Bank of Ireland data on bank lending shows that the flow of credit extended by the banking system became disproportionately concentrated on property, real estate and construction sectors from the years 2000 to 2008. Since the financial crisis, however, primary industries of agriculture, wholesale and retail trade now account for the largest share of new

lending in the economy (Menton and Sherman, 2014). Official banking data also shows that repayments of bank debt have outstripped new lending in every quarter since Q1 2010, when the exception of Q3 2011.

As regards European employment, SMEs have been hit hard since 2008, but have proved to be more resilient in terms of employment numbers. In 2009 alone, large firms across Europe lost almost 1.7 million jobs in comparison to just 677,000 for SMEs which account for the majority of European employment (European Commission, 2013). Despite this resilience, large firms have proved to recover much quicker in the subsequent years in terms of employment in comparison to SMEs.

The structure of this chapter is as follows. Section 1.2 describes the research field of this thesis and the rise of SME finance research. Section 1.3 provides a theoretical background to the research and the basis for this study. This section details the traditional theories of SME finance and details the recent movement in emphasis away from these traditional theories towards a new focus on working capital finance behaviour in SMEs. Section 1.4 outlines the research aims of this thesis, while Section 1.5 details the research methodology. In this section, the current trends in methods to analyse SME finance are detailed as well as the limitations and strengths of existing research methods. Section 1.5 also provides a detailed account of the processes involved in preparing and analysing data for the research. Finally, the section will highlight the benefits and limitations of the methodology chosen for this thesis. Section 1.7 outlines the structure of the thesis, detailing each of the chapters, while Section 1.8 details the output to date of this research in terms of publications, conference acceptances and working papers.

1.2 The research field: The rise in the importance of SME finance research

Since the beginning of the financial crisis in 2008, there has been a noticeable rise in emphasis on research and policy aimed at the SME sector internationally. At a European and international level, research has been carried out by the Organisation for Economic Cooperation and Development (OCED, 2013), most noticeably the OECD Financing SMEs and Entrepreneurs Scoreboard (2013), Bain and Company and the Institute of International Finance (IIF, 2013), The World Bank, the European Central Bank (ECB) and the European Commission (EC) (2012) among others. There has also been a rise in the number of academic published papers on SME finance in peer-reviewed journals such as the International Small Business Journal, Small Business Economics and Journal of Banking and Finance.

One of the first steps in understanding SMEs is improving the quality and scope of data available to policy makers and academics. In terms of improved data, the establishment of EU/ECB Survey on Access to Finance of Enterprises, also known as SAFE has been a major step forward in facilitating policy based research in the area of SME finance over the past 5 years. In addition to the increased focus on SME finance by policy makers and practitioners, there has also been a significant number of policy tools introduced at both country and EU level. Many of these instruments are referred to later in the thesis. While a significant restructuring has taken place by both ECB and domestic Central banks to deal with the banking sectors, domestic policy makers have introduced various instruments to encourage and facilitate lending and access to finance for credit constrained SMEs over the crisis with most countries introducing some form of loan guarantee scheme (OECD scoreboard, 2013).

1.3 Theoretical background

Table 1.1 Studies explaining capital Structure and financing behaviour

	Studies adopting the theory approach of explaining financing behaviour.				
Author	**Journal of Publication**	**Country, sample size, and Data**	**Method**	**Theoretical perspective**	**Principal findings**
Large firm and listed firm studies					
Myers and Majluf (1984)	Journal of Financial Economics	-	Theoretical model	Pecking Order	Due to assumptions of asymmetric information between firm managers or 'insiders' and that managers act in the interests of existing shareholders, firms prefer to finance investment opportunities through internal finance, then external debt and only external equity as a last resort.
Titman and Wessels. (1988)	Journal of Finance	U.S. Compustat data (469)	Lisrel system and empirically tests various theories of capital structure	Agency theory Debt tax shields Innovation Pecking order	Findings show the importance of transaction costs, past profitability and current debt levels, collateral value or future growth opportunities expenditure as determinants, while transactions costs are more significant small firms.
Rajan and Zingales. (1995)	Journal of Finance	International, Global Vantage data. 1987-1991	Cross sectional regression model and Tobit model	Empirical examination into the role of institutional factors	Findings indicate that differences in leverage are not easily explained by differences in institutional factors.
Shyam, Sunders and Myers (1999)	Journal of Financial Economics	US 157 firms continuously listed between 1971-1989	Flow of funds, OLS regression	Pecking Order	Finds that the pecking order is an excellent first order descriptor of observed capital structures.
Fama and French. (2002)	The Review of Financial studies	3,000 US listed firms 1965-1999	Theoretical and empirical	Pecking order Trade off theory	Find support for both pecking order and trade off theories.

Frank and Goyal. (2003)	Journal of Financial Economics	US Compustat data 1971-1998	Empirical regression analysis	Pecking order static trade off Mean reversion	Find that little or none of the predictions of the pecking order hold, especially for small firms. Small high growth firms are the primary issuers of equity in the US.
Flannery and Rangan (2006)	Journal of Financial Economics	Compustat data on 12,919 public firms for an average 9.6 years each over the period 1965-2001	Dynamic leverage modelling	Trade off theory	This study adds to the empirical findings on Capital Structure theory in favour of the Trade-off/ partial adjustment theory. The empirical findings demonstrate that constant unmeasured firm specific effects accounts for a large proportion of cross sectional variation in firm leverage, not previously accounted for within the
Huang and Ritter. (2009)	Journal of Financial and Quantitative Analysis	US CRSP and Compustat data 1963-2001	Time series leverage regressions	Market timing hypothesis Pecking Order	Finds diminishing support for the pecking order theory over a 30 year period, support the market timing hypothesis. Historical values of the cost of equity finance have long lasting effects on firms' capital structures.
Lemmon and Zender (2010)	Journal of Financial and Quantitative Analysis	CRSP and Compustat. US data 1971-2001	Simulations OlS regressions	Pecking order Debt capacity	After accounting for debt capacity issues, the pecking order is a good descriptor of capital structures.
Leary and Roberts (2014)	Journal of Finance	CRSP Compustat data: 9,126 firms 1965-2008	Panel data regressions	Industry average effect on Capital Structure decisions and Peer effects	Capital structure decisions are significantly affected by Peers. Firms' financing decisions are responses to the financing and characteristics of Peers.
Small firm (SME) based studies					
Chittenden et al. (1996)	Small Business Economics	UK Private + database of firms employing less than 100 people. (3408)	Panel data analysis OLS	Agency, Pecking Order Trade off theory	Financial structures of firms reflect rational trade-offs of costs, but overall reliance on internal finance and collateral as a means of obtaining debt finance dominate.
Cressy and Olofsson. (1997b)	Small Business Economics	Sweden. (285) survey responses	Survey questionnaire and tested hypotheses	Pecking Order theory	Existence of finance demand constraints, returns from profits, growth and survival are not enough to offset the utility of control loss.

Berger and Udell (1998)	Journal of Banking and Finance	US(NSSBF data 1993)	Descriptive analysis	Pecking Order Agency theory Financial growth life cycle	Capital structures vary with age and size of firm and can be analysed from a life cycle perspective.
Jordan et al. (1998)	Journal of Business, Finance and Accounting	South East England. (275) FAME	Heckman procedure with a Logit model	Pecking order and Strategy	Finds no evidence for industry effects in explaining capital structures, however competitive strategies are important. Finds support for the pecking order. Finds that turnover and sales are positively related to debt levels
Michaelas et al. (1999)	Small Business Economics	UK (3500)	OLS regressions	Trade off , Pecking Order and agency theory	Capital structures of small firms are time and industry dependent.
Berggren et al. (2000)	Small Business Economics	Sweden (281)	Structural Equation modelling	Asymmetric information. Control aversion Pecking order	Widespread scepticism among SMEs about external control. But technological development, financial strength and the perceived need to grow changes attitudes
Hall et al (2000)	International Journal of the Economics of Business	Lotus One database UK Taken in 1995 (3500)	Cross section regressions with measures of leverage as	Trade off theory Pecking Order theory	Finds long-term debt to be positively related to firm asset structure and size but negatively related to age, while short-term debt was found to be negatively related to asset structure, profitability, size and age, it was
Watson and Wilson (2002)	Journal of Business, Finance and Accounting	UK (626 SMEs)	Sample portioned into low and high information asymmetry. Cross sectional regression analysis.	Trade off theory Pecking Order and Agency theory	Finds that closely held SMEs (primarily manager owned) differ in their financing preferences over other types of SME ownership (more widely held). There is a preference among closely held managerial structures to be highly reliant on short-term debt financing rather than long term debt. This is due to the higher information requirements and costs associated with long term debt. Widely held firms are better placed to meet these information requirements. The perceived high risk of lending and high monitoring costs means that suppliers of finance will require a much higher premium.
Hogan and Hutson. (2005)	Global Finance Journal	Ireland (175 SMEs)	Descriptive analysis of primary survey data on NTBF's	Modified Pecking Order theory	This paper finds that among the sector of new technology based firms, internal funds are the most important source of finance, with debt rare and equity finance dominating external financing needs.
Johnson and McMahon. (2005)	Small Business and Enterprise Development	Australian Government longitudinal survey 1994-1998	Logistic regression	Industry average effect	The paper finds that even after controlling for characteristic such as size, age, profitability, growth asset structure and risk, cross-industry differences in SME financing behaviour do exist.
López- Gracia and Sogorb- Mira (2008)	Small Business Economics	Spain (3569)	Generalised method of moments(GMM) and two stage least squares	Trade Off and Pecking Order theory	Results support trade off theory, in that SMEs aim to reach a target (optimum) level of leverage. NDTS, growth opportunities and internal resources all determine capital structures.

Cotei and Farhat. (2009)	North American Journal of Finance and Banking research	US Compustat and CRSP data	Multivariate regression analysis	Pecking Order Trade off theory	Aims to determine are both theories exclusive. Find that both theories are not mutually exclusive, but both serve a role in explaining capital structure decisions.
Psillaki and Daskalakis. (2009)	Small Business Economics	Panel data 1997-2002 Amadeus	Tests a series of hypotheses using a panel dataset	Pecking order Static trade off theory	SME capital structures across countries are determined in a similar way, primarily due to civil law systems. Differences arise due to firm specific effects. Size is positively related to leverage, while asset structure, profitability and risk is negatively related,
Mac an Bhaird and Lucey. (2010)	Small Business Economics	Ireland (299 survey response)	OLS with seemingly unrelated regression (SUR) to examine industry effects.	Agency theory Pecking Order theory	Finds that Age, size, ownership structure are all important determinants of SME capital structure and the provision of collateral is very important across industries, implying a universal effect of information asymmetries.
Vanacker and Manigart. (2010)	Small Business Economics	Belgian accounting data covering all firms > 10 employees. (32000)	Splits sample between high and low growth firms. Logistic regression applied.	Static trade off Pecking order theory	Finds that for high growth firms, new equity issues are important for them to grow beyond their debt capacity level. High growth, firms with low cash flow, intangible activity or high risk have low debt capacity have greater reliance on external equity.

Table 1.1 displays the most prominent studies in capital structure theories of both large and small firms in the literature as well as their empirical findings. The table presents papers dating from Myers and Majluf (1984) to Leary and Roberts (2014) detailing the development of both theoretical and empirical evidences for large firm. This is then followed by the theoretical and empirical developments in the literature on SME capital structure from Chittenden, Hall and Hutchinson (1996) to Vanacker and Manigart (2010). Many of the studies on SME finance are based on the theories of capital structure applied to and empirically tested in the case of large firm. Section 1.3.1 details the development of theoretical knowledge on capital structure and its application to the study of SMEs. These theories are further developed and explained in

Chapter 2 of this thesis, while section 1.3.2 details the more recent developments in SME finance literature.

1.3.1 Capital structure theory in SMEs

Research indicates that capital structure theory in small firms originates from corporate finance theory and specifically the Modigliani and Miller contributions (1958, 1963). Two key propositions that highlight that firm financing choices are based on the difference between the cost of debt and equity finance, the role of tax deductibility of debt finance and ultimately the impact of financing choices on firm value. Established financial literature has, however, highlighted a significant wedge between the costs of internal and external finance for small firms (Carpenter and Petersen, 2002, Berger and Udell, 1998), with asymmetric information being the most significant reason why the costs of external funds are significantly greater than internal funds (Berger and Udell, 1998). Information asymmetries refers to the differences between the knowledge and information among business owners/ managers about the value of assets and future growth opportunities of the business that outsiders can only estimate based on their observed information on the business. As a result, the use of external finance by firms comes at a cost and is conditional on the severity of agency costs between the borrower and the lender (Jensen and Meckling, 1976).

Agency theory has been found to be particularly important in determining the financing of SMEs, as agency costs come in the form of information asymmetry, adverse selection and moral hazards that arise as a result of the

contractual agreements between the providers of external finance and the firm (Chittenden, Hall and Hutchinson, 1996; Jensen and Meckling, 1976). The problem of agency costs come in the form of monitoring, which maybe more costly for banks to obtain from small firms given the lack of requirements to disclose information pertaining to them (Bass and Schrooten, 2006). As a result, moral hazard maybe a greater issue for small firms. Given that information and data on contractual arrangements has been historically limited for the purposes of financial research, efforts to test the degree of agency problems has been difficult and restricted (Walker, 1989).

As a result of the perceived adverse selection among the providers of external finance, a premium on the funds lent to small firms applies, and the higher this premium, the greater the level of discouragement from debt finance (Myers 1984). Ultimately, firms and, in particular SMEs will chose sources of finance least subject to information asymmetries, therefore avoiding external funds where possible (Cressy and Oloffson, 1997). Similarly, due to the preference to retain ownership among SMEs, when external financing is required, debt financing is often preferable as its least subject to information asymmetries, therefore requires a lower premium and avoids existing shareholders having to relinquish their share of ownership of existing assets (Watson and Wilson, 2002; Myers and Majluf, 1984). Accordingly, the implications of asymmetric information and agency costs means that SMEs prefer to finance according to a pecking order, whereby internal finance is the most preferable source of finance, followed by debt finance and external equity finance as a last resort (Frank and Goyal, 2003).

Over time, the Pecking Order has emerged as the primary theoretical lens to view SME/ small unlisted firms' capital structure, and has been cited extensively in research as an excellent descriptor of capital structure and financing decisions among SMEs (Chittenden et al., 1996; Jordan et al., 1998; Berggren et al., 2000; Watson and Wilson., 2002 and Mac an Bhaird and Lucey, 2010). Accordingly, capital structure theory has focused on three strands including, firm specific, country specific and the impact of macroeconomic factors, with firm specific factors occupying the majority of interest within academic research (Titman and Wessel, 1988; Berger and Udell, 1998, Michaelas, Chittenden and Poutziouris, 1999) . Due to the heterogeneity of the SME sector and their observed characteristic differences to that of large firms, the age, ownership structure, industry setting etc have all been analysed as important determinants of financing choice. The capital structure of SMEs is likely to differ from large firms for a number of reasons, including the greater degrees of informational asymmetries and reliance on internal funds among SMEs. SMEs often have less collateralised assets, hence obtaining bank finance is challenging. Often they are not as diversified as large firms, thus there is a greater level of risk and bankruptcy associated with them.

More recently, primarily due to improvements in data availability, a growing number of studies have analysed the relationship between country specific characteristics and firm level characteristics and SME finance. Some studies highlight that country effects outweigh the influence of firm specific effects in access to finance, particularly for small firms (Joeveer, 2013; Frank and Goyal, 2009), while other studies maintain that firm specific effects outweigh country specific effects in determining firm leverage (Psillaki and Daskalakis, 2009;

Hall et al., 2004), however there remains no consensus on this issue within the literature. It has also been shown that country and firm specific effects are not mutually exclusive, but country effects have direct and indirect influences on firm level outcomes (De Jong, Kabir and Nguyen, 2008; Korajczyk and Levy, 2003). Despite these studies, very few studies have examined the role cross country and institutional effects over time on unlisted SME financing behaviour, and this research aims to fill that gap in the existing literature. Table 1.1 above summarises the papers, empirical methodology, data, theoretical findings and contextual settings based on the findings for capital structure and financing decisions of small and large firms.

While the Pecking Order theory is a valid explanation of observed capital structures among SMEs, recent developments in SME finance literature have moved to focus more on the working capital behaviour of SMEs (Vermoesen, Deloof and Lavern, 2013, Banos-Caballero, García-Tereul and Martínez-Solano, 2012 among others). New data sources inform us that approximately only 5 percent of European SMEs surveyed are reported to have used equity finance in the past 6 months, whereas 45 percent have used or have experience in using trade credit (Survey on Access to Finance, 2013), indicating that equity finance is not a major finance source for SMEs, with the possible exception of high tech software firms. Similarly, other data sources indicate that as many as 1 in 3 SMEs have no outstanding debt (Central Bank, 2014).

Given the fact that almost one in three SMEs have no debt finance (Central Bank, 2014, B.I.S., 2012), this research aims to not only empirically test the conventional theories describing SME financing behaviour, but to offer a new approach in understanding the financing behaviour of SMEs. Among the aims

of the research are to analyse the recent movement in emphasis in SME finance literature away from traditional theories of capital structure based on debt versus equity financing in the SME context, but towards theory which focuses on the working capital and short-term operational financing behaviour of SMEs.

1.3.2 Working capital in SMEs

Table 1.2 below displays some of the most prominent studies in SME working capital literature over the past few years. These studies are the closest in relevance to this thesis in that they use actual firm level accounting data (with the exception of Casey and O'Toole, 2014). Despite this, none of these studies contain the scope of the data used in this thesis. Carbo-Valverde, Rodriquez-Fernandez and Udell (2009) examine the role of working capital and investment among SMEs over the period leading up to the crisis. Despite the conventional belief that trade credit is primarily short-term source of finance (Petersen and Rajan, 1997), their study finds that trade credit plays a significant role in investment among credit constrained Spanish SMEs. Similarly, for a sample of Spanish SMEs, Martínez-Sola and Garcia-Tereul (2013) and Banos-Cabellero, García- Tereul and Martínez-Solano (2012) also find that working capital management and the use of trade credit among SMEs played a significant role in sustaining sales and profitability for SMEs in financial distress. A major advantage of this research is the inclusion for the first time a cross-country analysis of the working capital management and analysis of trade credit use among SMEs, and its importance over the financial crisis period and beyond (2008-2012).

Table1.2 Existing panel studies using balance sheet firm level data on the working capital of SMEs

Paper	Database	Countries	Time Period	No. of SMEs
Carbo-Valverde et al. (2012)	Amadeus	Spain	2004-2008	3,404
Psillaki and Daskalikis(2009)	Amadeus	Four western countries	1997-2001	11,654
Martínez- Sola et al. (2013)	SABI database(BVD) of Spanish SMEs	Spain	2000-2007	11,337
Banos-Cabellero, García-Tereul and Martínez-Solano (2012)	SABI database(BVD) of Spanish SMEs	Spain	2002-2007	1008 Spanish SMEs
Casey and O'Toole (2014)	SAFE Data	11 Western countries	2009-2011	3,500

As the first study to examine the working capital behaviour of SMEs in the aftermath of the 2008 financial crisis this thesis adds to the emerging field. The thesis is the first to empirically test for and quantify the redistribution of credit for SMEs over the financial crisis based on actual firm level accounting data. The research demonstrates that the financial position is the key determinant of trade credit use and in SMEs. It is also the first to demonstrate the relation between trade credit use and the probability of survival among SMEs.

1.4 Aims and objectives of this thesis

This thesis aims to examine the impact of the financial crisis on the financing behaviour and decisions of SMEs. In particular, the thesis focuses on the role of trade credit in SME finance. In doing so, the research aims to examine the link between the restrictions in bank finance and the financing decisions of SMEs in the aftermath of the financial crisis. The study aims to demonstrate the

transmission of credit restrictions to SMEs from the banking sector and its influence on inter-firm financing via trade credit.

More specifically it addresses the following three questions within the debate on SME finance.

First, from a theory perspective, how can we best understand the financial decision making of SMEs with regard to working capital over the business cycle? This first of all, I test the applicability of existing theory regarding financing decisions among SMEs. This involves scrutiny of the existing theories of SME capital structure and financing decisions and how they perform over the business cycle and financial crisis period, in particular, the examination of the performance of Pecking Order theory. Second, given the reliance of SMEs on bank finance, what has been the role of alternative funding throughout the crisis period and, in particular, what has been the role of trade credit finance? Third, what other factors including firm specific, financial position, industry specific, country and institutional characteristics and macroeconomic factors affect trade credit use?

To answer these questions, the research accesses a unique panel of financial statement data for SMEs over the years 2004-2012. The findings of this research are not only relevant for Irish and European SMEs, but relevant elsewhere given the global nature of the financial crisis.

A key contribution of the research is the use of panel data analysis based on real accounting data as opposed to survey estimates to provide both cross sectional and longitudinal analysis of SME financing behaviour. An acknowledged weakness in SME research to date is the lack of research based on standardised SME data internationally and in particular on small firms (OECD, 2013). For

this reason, many studies have tended to rely on survey data with limited coverage and accounting measures. In addition to this, many of the existing studies on SME finance are based on very small sample sizes upon which inferences are drawn, therefore inadequate to capture changes over time, firm heterogeneity as well as shocks to the financial system. This analysis demonstrates that panel data is now a pre-request for the study of SME finance. Panel data has several advantages, including the ability to control and account for omitted variables and unobservable firm heterogeneity that influences results using detailed values of many balance sheet variables across firms and over time. As well as methodological and statistical benefits, the data also has the advantage of differentiating surviving and non-surviving firms over a period of time.

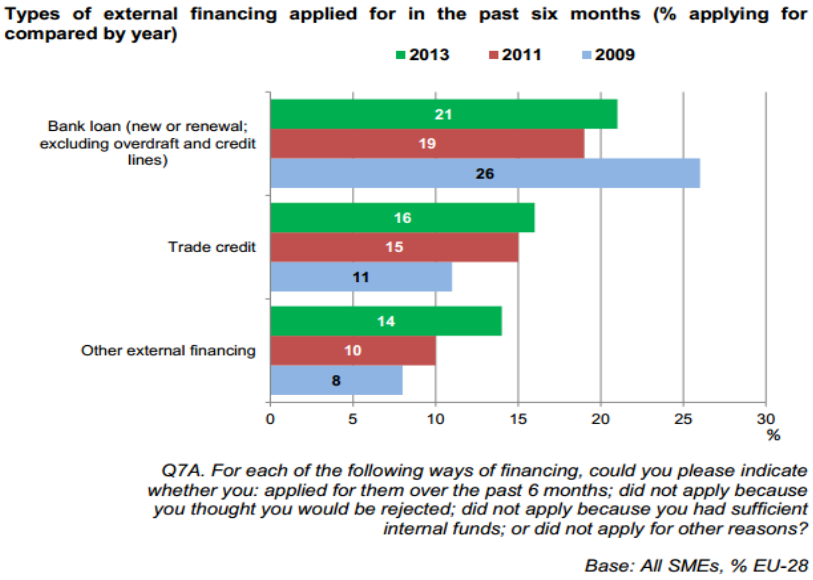
1.5 The research methodology

1.5.1 Current trends

One of the major contributions of this research, apart from the focus on short-term finance decisions of SMEs, is the scope of the firm level data upon which this research is based and its advantages over other self-reported data, such as SAFE. One of the major benefits of SAFE data has been to highlight the changes in perceptions among SMEs regarding their access to finance over the crisis period. The most recent SAFE survey findings report that the highest levels of reliance on internal funds amongst European SMEs was in Hungary and Slovakia. In terms of trade credit use, applications for trade credit were reported to be highest among SMEs in Spain, Italy and Greece and lowest in Latvia, Estonia and Hungary (European Commission, 2013). Overall, trade

credit use across the EU was reported to be 32 percent in 2013, same as in 2011, while applications for new or renewed bank loans were 32 percent very close to the 2011 level of 30 percent.

Figure1.3 Types of external finance applied for by SMEs according to SAFE [3]



However, over time it has become clear that SAFE data *alone* provides an insufficient description of the actual financing of SMEs and consequently cannot be solely be relied on to inform policy from the reasons outlined in 1.5.2.

1.5.2 Limitations of existing data

Since the onset of the financial crisis reference has been made to the lack of quantitative data on SME finance research (OECD, 2013). Despite the changes in policy and availability of finance over since 2008, there appears to be little

[3] http://ec.europa.eu/enterprise/policies/finance/files/2013-safe-analytical-report_en.pdf

change in terms of SMEs' responses regarding access according to SAFE. This is evident from the construction and context of SAFE data. For example, a recent report in 2013 titled 'SME Access to Finance Survey' compared responses of SMEs across Europe from the first wave of the SAFE survey in June 2009 to that of the responses of SMEs sampled in the June 2013 wave of the survey. The results contained little variation over the crisis period in terms of the responses of SMEs. One in five SMEs survey responded as not using any source of finance in the past 6 months, and this figure was the same in 2009 and in 2013. When asked in both periods on a scale of 1-10, what is the most pressing problem for their firm? Out of a list of 8 factors including finding customers, availability of skilled labour, regulation, competition, costs of production and other factors, 15 percent of respondents across EU 27 stated access to finance as the most pressing problem in both 2011 and 2013, despite variations across countries.

In each wave of the survey access to finance was cited in second place after finding customers as the most pressing problem for SMEs. As regards SME views in terms of accessing bank finance, the results over the two periods were broadly similar with the proportion of SMEs not confident in accessing bank finance in 2009 at 25%, while this figure fell to 24% of respondents in 2013 despite the widespread policy measures in the intervening period. Given that the results from SAFE illustrate that financing conditions are broadly unchanged over the crisis period, the figures do illustrate substantial cross country differentials. Accessing finance is reported to be the most pressing problem for 40 percent of the SME surveyed in Cyprus and Greece, while only 6 percent of SMEs in Luxembourg report access to finance as the most pressing problem

facing them. Similarly, SMEs that applied for a bank loan in the past 6 months were most likely to be successful in Germany, Austria and Finland and least likely to be successful in the countries of Greece, Lithuania and Cyprus.

Despite this, there has been a major development in terms of the quantity of new research and data on SMEs financing many through sourcing SME accounting data. Mac an Bhaird and Lucey (2010) and Hogan and Hutson (2005) are some examples of research on SME finance whereby the researcher has commissioned their own surveys and interviews to gather data for the purpose of SME finance research. In addition, studies examining SME capital structure using cross sectional data can be found in Watson and Wilson (2002), Jordan, Lowe and Taylor (1998), Hall, Hutchinson and Michaelas (2000) and Danielson and Scott (2007) among others. These studies have proved to be very important in informing policy and debate on SME finance. One criticism, however, is that the scope of these studies has been somewhat limited due to the quantity and cross sectional nature of the data available to the researchers. Some other studies, such as Johnson and McMahon (2005) have gathered longitudinal data. Longitudinal data is useful in examining the changes in financing structure of a cohort of enterprises over time. These studies have tended also to be one country focused, therefore little research has tended to focus on cross country differences with the exception of Psillaki and Daskalikis (2009) and Hanader, Brocardo and Bazzana (2014).

Limitations of SAFE and other existing Survey Data

As stated, one of the most prominent surveys of access to finance for firms commissioned since the start of the financial crisis is the ECB Survey on Access to Finance, also known as SAFE data. The survey has been carried out every six

months since June 2009 to assess the financing conditions of firms across the Euro area[4] and contains on average the responses of 6,000 SMEs across the Euro area, however the level of responses to many of the specific questions often amount to over half of the enterprises surveyed. The survey questionnaire asks respondents to reply to a number of finance related questions with a set of provided options to which respondents answer to. The data generated from the survey is therefore categorical and ordinal in nature.[5] Categorical data limits the scope of SME finance research from a number of perspectives.

a) The SAFE questionnaire does not provide information on the financial structure of SMEs in terms of actual amounts, only in terms of amounts that accounts to categorical ranges. The data obtained from the survey therefore does not detail the level of profitability, level of indebtedness or the cash position of the firms. This limitation is significant in assessing the change in the financial position of firms.

b) The data from SAFE is derived from a telephone survey and represent the views and beliefs of enterprises at a particular point in time. Opinions and perceptions are not ordinal and often are subjective in nature (Fernando and Mulier, 2013[6]) and furthermore cannot be equitable over time.

[4] See latest SAFE report: https://www.ecb.europa.eu/pub/pdf/other/accesstofinancesmallmediumsizedenterprises201404en.pdf??da920468528300ff549d8cc95522eb81 [Accessed: 10th September 2014]

[5] Please see Access to Finance survey questionnaire: https://www.ecb.europa.eu/stats/money/surveys/sme/html/index.en.html [Accessed 10th September 2014]

[6] http://www.eea-esem.com/files/papers/eea-esem/2012/429/financial_constraints_FerrandoEEA.pdf [Accessed 9th September 2014]

c) Given that the data is categorical in nature, empirical estimation is limited to binary choice estimation, whereas traditional regression estimation such as least squares based on continuous data is not possible.

d) There may be response bias, in that certain enterprises are influenced by the wording and phrasing of the questionnaire. As true with any self-reported data, the responses will be influenced by views of the SME manager on the day.

e) SAFE data only asks respondents what is the most pressing problem regarding access to finance. A firm cannot signal more than one problem for a specific question.

f) Panel data analysis is restricted with SAFE data as a different sample of firms in sampled in each panel. While this does not prohibit panel analysis, it makes the estimation of firm fixed effects impossible as firms are not uniquely identifiable; therefore the ability of the research to follow the changing circumstances for a particular firm over a period of time is restricted. Firm fixed effects have been shown to account for a significant proportion of the variation in listed firms capital structure (Flannery and Rangan, 2006), so failure to account for this likely leads to model misspecification (Baltagi, 2008).

The empirical analysis in this research is based on direct balance sheet and profit and loss accounts of enterprises over the period 2004-2012. The benefits of this are that the analyses upon which findings are based are sourced from the actual company account figures and contain direct measures of the actual financial position of SMEs during the financial crisis. This, I believe makes this research practical and reliable for informing policy.

1.5.3 Data sources and preparation

As highlighted thus far, one of the major contributions of this study is the size and scope of the data analysis on SMEs. To the best of my knowledge, there is no existing study on SME finance which covers a comparable sample of primarily unlisted SME profit and loss and balance sheet data. The data for this study was obtained from the FAME and the AMADEUS databases, respectively. Both of which are supplied by Bureau Van Dyk. FAME, short for 'Financial Analysis Made Easy' database contains data on firms from the Republic of Ireland and the United Kingdom. The data used in this research are derived from firm accounts filed at the official Irish government's Companies Registration Office (CRO). The benefits of this mean that the findings of this research are based on actual financing decisions and behaviour over a ten-year period. While the data supplied by firms is limited to Irish and UK companies, Amadeus database contains financial and firm level data on both private and publicly traded firms from across Europe. The data however, varies in quality of coverage depending on firm, region and across variables.

The data obtained from Amadeus also known as 'Analyse Major Database from European Union Sources' for this study was downloaded in May 2013, which means the latest year of firm level data is 2011, with some coverage of 2012. When selecting data for download, data was chosen from each individual country of interest, including all the main financing variables of interest and proceeded to download. Due to the difficulty restricting the criteria for download, downloading and cleaning of this data took a lot longer than had been originally anticipated. In total, information on almost half a million firms were downloaded in separate excel files containing approximately 3,500 firms.

These excel files were combined and merged to single excel files for each country, resulting in 15 separate country excel files containing a mixture of both core and peripheral European countries.

With each excel file, the data was initially cleaned. To work with this data in STATA (the software used in this study's analysis), all data must be in long format, this meant that all written letters for missing data such as (n.a.;s.a.;s.n.; n.s.;) had to be removed. In addition all data was formatted to round up decimal places to whole numbers. Once this was done, the individual excel files were saved in comma delimited format to be ready for import in STATA.

Subsequently, it was necessary to construct the variable of interest for the study. For example, while the data downloaded contained relevant balance sheet and profit and loss account data and approximately 15 variables for each country, it was necessary to create specific variables for the study that were not readily available from the database. These would include the creation of ratio variables such as the ratio of firm sales, cost of sales and other financial variables by firm assets for the purpose of later regression analysis. In addition variables such as firm age were constructed from incorporation dates of firms stated in downloaded data. Data was separated for each individual variable and for each country and combined together to create a single file and then transformed from wide format to long format for the purpose of panel analysis. All financial data was winsorised at the 1 and 99 percentile level to mitigate the effect of extreme outliers. Once this was done each of the transformed variables were merged together in a panel data and analysis was ready to begin.

Given the complexity in the estimation and study of panel data, it was necessary to take a number of courses in preparation of this research. Since finishing my

masters' degree in 2008 and prior to beginning my PhD studies in early 2011 until submission, I have taken a number of academic courses particularly in the area of Finance and econometrics to facilitate the research. These include

- Dynamic and non-linear Panel data Analysis using Stata with Sergi Jiminénez-Mártin, GSE Economics Summer School, Universitat Pompeu Fabra, Barcelona (July 2014).
- Linear Panel Data Analysis with Badi Baltagi, GSE Economics Summer School, Universitat Pompeu Fabra, Barcelona (July 2013).
- GMM for Panel Data using STATA with assessment, Steve Bond (University of Oxford). UCD April 2012
- Econometric Applied Causal Analysis in U.C.D. (June 2010).
- Financial Crises by Professor Jerry Caprio, Trinity College Dublin (Autumn 2009/2012)

1.5.4 The benefits of panel data

This study is the first that applies panel data analyses using the FAME and Amadeus data to examine SME working capital behaviour over the financial crisis. The advantages of panel data in this study are significant. Panel data allows for the study of the changes in financing over a period of time and ultimately, gives the researcher more information, more variability, more degrees of freedom and more efficient coefficient estimates (Baltagi, 2008). Most importantly in terms of estimates, panel data allows for the control of unobservable and individual heterogeneity (Askildsen, Baltagi and Holmas, 2003) which often leads to biased results with other forms of data. In addition, panel data is most appropriate in studying the dynamics of adjustment

(Rodriguez-Rodriguez, 2006), which is particularly important since my data covers a period of significant change in financing behaviour.

In employing Fixed Effects estimation, the analysis captures the net effect of the financial crisis on trade credit use and other sources of financing. Similar to Love et al. (2007), Fixed Effects estimation allows for the controlling of time invariant and unobservable firm specific characteristics influencing SME financing decisions and trade credit use. This is particularly important given the dynamic behaviour and diverse characteristics of the SME sector (Jordan, Lowe and Taylor 1998; Berger and Udell 1998).

For example, to illustrate the benefits of Fixed Effects, take a simple static estimation where Y_{it} is the dependent variable capturing finance received of the firm i at time t, and X_{it} is a vector of time varying independent variables for a group of firms over time (t) that explain Y_{it} and C_i are the time invariant factors that explain Y_{it} , and $\cup_{it}$ is the unobservable error term comprised of both the fixed heterogeneous unobservable component (μ_i) and (v_{it}) the time varying error component.

$$Y_{it} = C_i + X_{it}\beta + \cup_{it}$$

$$where\ \cup_{it} = \mu_i + v_{it}$$

One of the major advantages of panel data is the ability to control time invariant unobservable heterogeneity, or the individual specific characteristics unique to a particular firm (Flannery and Rangan, 2006). These could be anything from the ability of individual SME managers or factors that are unobservable and cannot be captured among the variables in the model. The addition of panel data allows for the estimation through Random or Fixed Effects. While Random Effects

assume that the variation in the error term across cases is random, i.e. the covariance between C_i and $\cup_{it}$ are zero, Fixed Effects, however, assumes that μ_i's are correlated with individual X's. Therefore Cov ($X_{it,}C_i$) ≠0, therefore time invariant individual effects are eliminated from the error, controlling for differences between cases that are constant over time. For estimation to be unbiased and consistent, requires strict exogeneity of individual regressors.

Given that fixed effects has the ability to control for omitted variable bias that may be correlated with the explanatory variables, panel data analysis is effective in limiting endogeneity in the estimation procedure. In this thesis, a Hausman test was conducted to test if each of μ_i are correlated with individual regressors. Based on the rejection of null hypotheses that μ_i and xi's are not related, Fixed Effects estimation shall be conducted. The benefits of panel, not only produce more consistent and unbiased estimates over cross-sectional least squares estimation, they also have the ability to control for past values of variables and lags can therefore lags can be used as instruments for endogenous regressors.

1.6 The structure of the thesis

The thesis is structured in the form of three linked studies. Each study has its own constructed and detailed sample and methodology. The structured is as follows. Chapter 2 examines the existing theories and empirical research on SME financing behaviour and capital structure. This chapter titled *SME capital structure: The pecking order theory and the financial crisis* use a panel sample of English, Scottish and Irish SMEs and test the Pecking Order Theory (POT) as a predictor of SME capital structure. The paper also draws upon a methodology commonly used in large firm corporate financing literature, but not previously

applied in the case of SMEs. By using this methodology, also known as the modified flow of funds regression, the paper shows the proportion of SMEs' financing deficit, accounted for by debt finance over the business cycle. While accounting for debt capacity, the research finds diminishing support for the POT for SMEs and predicts that alternative sources of financing have increased in importance for many SMEs. Nevertheless, the predictions of the theory regarding profits, size, age and tangibility are all upheld. Finally, the paper highlights critical changes in SME financing since the onset of the financial crisis, including observed investment behaviour amongst the sample of SMEs.

Drawing on the findings from Chapter 2, the second stage of the research examines the role of alternative sources of finance for SMEs. This is documented in Chapter 3 entitled *Bank credit and Trade credit: Evidence from SMEs over the financial crisis.*

This chapter uses panel data to test the extent to which trade credit has acted as a substitute for bank finance in SMEs in the aftermath of the financial crisis of 2008. It demonstrates that the reduction in the supply of funds to SMEs was compounded by the contraction of net trade credit within the sector. Nevertheless, trade credit played a vital role in the adjustment of the sector by easing the burden of financial crisis for some SMEs. Thus, the relative importance of trade credit increased for financially 'vulnerable' SMEs that were less liquid, highly dependent on short-term bank finance, and with a higher proportion of intangible assets, when entering the crisis. In terms of a redistribution effect; financially stronger firms extended relatively more trade credit to financially vulnerable SMEs in aftermath of the financial crisis. In addition, the analysis demonstrates that the financial position of SMEs entering

the crisis was more important in determining the impact of the financial crisis on trade credit than company characteristics of age and size.

In Chapter 4, the study is extended to consider the role of institutional and country specific characteristics in influencing SME finance. Unlike much of the existing research, this study includes a comprehensive analysis firms financing responses to the financial crisis. The study draws upon existing research on institutional and macro level factors and analyses their role in SME financing behaviour. This chapter titled *Trade credit and Bank credit; A perspective on European SMEs.* The research extends upon the work in Chapters 2 and 3 and examines changes in SME finance for a sample of European countries. While examining differences in the financing of SMEs across the Euro area, the research also examines how these differences are influenced by economic and institutional factors across regions. Using data from 15 European countries, including core European states and periphery states, this chapter also introduces a number of important methodological extensions to the examination of SME financing, and a country, economy and financial factors as well as measure of a composite risk for each country in the sample.

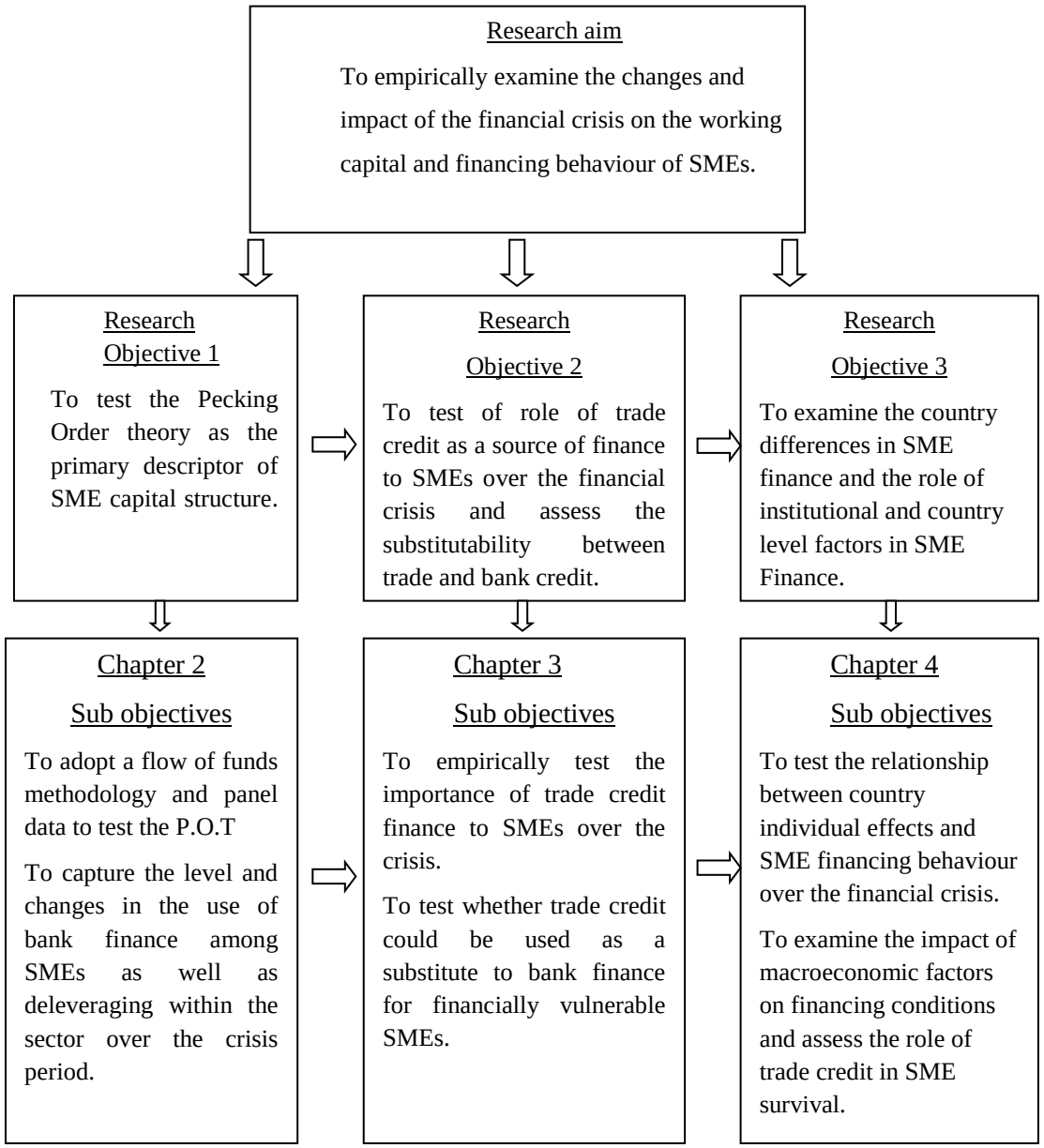
Finally, given the important role of trade credit in SME finance highlighted in this research, I test its likely impact on firm survival over the crisis period.

In line with the European Commission (2005) SME definition[7], my final sample contains 2.1 million firm-year observations on European SMEs over the period 2003-2012. In total, the sample contains approximately 283,360 firms across 15 European countries. Firm industry sectors are categorised according to two digit

[7] SMEs are defined according to the European Commission (2005) criteria, which includes firms that employ less than 249 workers in a given year and have either an annual turnover of less than €50m or a balance sheet total of less than €43m in a given year.

NACE 2007 codes and firms are assigned to 20 separate industry sectors. The analysis excludes all financial and insurance companies, in line with existing empirical studies, as well as public utilities such as public transport and postal services are also excluded from the sample. Summary statistics for all data used in this research are included in the Appendix of tables. The following is an outline of the conceptual framework of the thesis, summarising the research aims and objectives of each study and where they fit in each of the following chapters.

Table1.3 Conceptual map of thesis



1.7 Key findings from the research

a) Theoretical models explaining financing decision making of SMEs ought to pay greater attention to working capital and short-term financing behaviour as opposed to traditional capital structure theories based on debt versus equity finance.

b) Trade credit acted as an important source of finance for many financially vulnerable firms throughout the crisis period and influenced survival. Larger, older firms and firms with the greatest cash reserves were net financiers and extenders of credit to other SMEs over the past four years.

c) Common law countries of Ireland, UK and French civil law countries of Belgium, France, Italy, Spain and Portugal all exhibited higher levels of net credit extension over German, Scandinavian and Socialist origin countries

d) The results show a negative relation between the levels of net credit extended economy wide and Composite risk measure index. This result most likely indicates an overall negative impact of overall economic, political and financial risk on the level of inter-firm financing.

e) Banking concentration, GDP growth and credit issued by banks are positively associated with the levels of inter-firm financing in the SME sector, while regulatory quality and political stability are inversely related to the levels of inter firm financing economy wide, holding all other economic, financial and firm level observable and unobservable factors constant. In particular, improved regulatory quality tends to reduce the reliance on trade credit finance among SMEs.

f) While country and institutional factors are an important determinant in SME finance, firm specific characteristics in particular the financial position of SMEs have the greatest impact on SME financing behaviour.

g) Length of days SMEs await payment for goods varies significantly across country with Greece, Portugal, Spain and Italy waiting twice or three times the average length of time compared to Finland, Germany, Sweden and the UK.

h) Firms in the sectors of agriculture, accommodation, food and health care receive the lowest level of trade credit financing relative to wholesale, management companies and retail.

i) Finally, the results also show that trade credit financing had a positive influence on firm survival. Survival is determined and influenced over the crisis by both the level of debt overhang among SMEs and SMEs access to trade credit when bank finance is restricted.

1.7 Output from this research to date

One study from this thesis has been accepted for publication in The International Small Business Journal, a leading internationally ranked academic journal. The International Small Business Journal publishes academic research in a range of issues relating to SMEs. In addition to this, the two other studies have been accepted for and peer-reviewed for a number of international finance and economics conferences. The peer review process including presentations has helped critique and advance the research in this thesis. The following details the published paper based on Chapter 3 and the conferences in which each of the studies were presented.

- McGuinness, G. and Hogan, T. Bank credit and Trade credit: Evidence from SMEs over the financial crisis. *International Small Business Journal*, doi:10.1177/0266242614558314
- The 10th ECB European Commission COMPNET Workshop, Banco De Portugal, Lisbon. Trade credit and Bank credit, Evidence from European SMEs over the financial crisis, September 18-19, 2014.
- The 8th Portuguese Finance Network Conference (PFN), School of Economics, University of the Algarve, Vilamoura, Portugal. Paper title 'Trade credit and Bank credit, theory and empirical evidence from European SMEs, June 18, 2014.
- The Irish Economic Association Conference (IEA), Paper title 'Trade credit and Bank credit, Evidence from Irish SMEs over the financial crisis, May 8th, 2014.

- The 11th INFINITI Conference on International Finance, Aix en Provence, France. Paper title ‘Trade credit and Bank finance: Evidence from SMEs over the financial crisis’ June 12th, 2013
- McGuinness, G. P and Hogan, T (2012) SME Capital Structure: A panel data analysis of SME financing behaviour in Ireland, England and Scotland, 2004-2011. Paper presented at *The 25th Anniversary Irish Accounting and Finance Association (IAFA)* conference, NUIG, Galway. May 24-25.
- McGuinness, G. P and Hogan, T (2012) SME Capital Structure: A panel data analysis of the Pecking Order in Ireland, England and Scotland, 2002-2009. Paper presented at the INFINITI Conference on International Finance, Trinity College Dublin, June, 2012.
- The Irish Society of New Economists 8th Annual meeting, The Institute of Bankers, Dublin 1. Paper title 'SME Capital Structure and the Pecking Order Theory', August 18th, 2011.

Chapter 2: SME capital structure: The Pecking Order theory and the financial crisis

2.1 Introduction

The operation of many businesses and their survival are highly dependent on external finance and this is especially true for SMEs (Berger and Udell, 2006). Understanding the capital structure decisions and constraints of SMEs is crucial for informing policy makers and improving our understanding of the SME sector. This study seeks to examine how useful, one of the more prominent theories of capital structure, the Pecking Order theory, is in explaining SME financing decisions.

Although the Pecking Order was originally applied to explain the capital structure of large firms, a growing number of studies have extended its use to explain the financing decisions of SMEs (Chittenden, Hall and Hutchinson, 1996; Berger and Udell, 1998; Michaelas, Chittenden and Poutziouris, 1999; Hutson and Hogan, 2005; Mac an Bhaird and Lucey, 2010) and in particular small privately held SMEs (Cosh and Hughes, 1994; Berggren et al., 2000). This is not surprising, as the dominance of internal funding and the absence of equity are long established empirical features of SME financial structure (Bolton Report, 1971: BIS, 2012).

Given that information asymmetries are at the heart of the pecking order theory, and more acute for SMEs (Berger and Udell, 1998), it is reasonable to expect that SMEs would follow the pecking order more closely than their large, publicly traded counterparts. Yet to date, there appears to be a conflict between theory and empirical evidence. Firstly, Barclay et al (2006) find that high

growth SMEs consistently use less debt finance than the Pecking Order theory (POT) would predict. Secondly, some studies point to the fact that more and more small firms are becoming publicly traded and that these firms do not issue equity under duress, as implied by Pecking Order (Fama and French, 2005). And thirdly, some researchers find that the theory performs better in the case of large firms as opposed to small firms (Leary and Roberts, 2010; Frank and Goyal, 2003), which also contradicts the predictions of the Pecking Order. Despite these differences and the assumption that the Pecking Order requires a separation of ownership and control, a characteristic of most large enterprises, but not generally applicable to SMEs, a considerable number of studies report the Pecking Order to be an excellent descriptor of SME capital structure (Chittenden et al., 1996; Jordan et al., 1998; Berggren et al., 2000; Watson and Wilson., 2002; Mac an Bhaird and Lucey, 2010 and Vanacker and Manigart, 2010).

This study makes a number of empirical and methodological contributions to the study of SME finance. Firstly, the research applies a much more sophisticated test of the POT than hitherto employed in SME research. Few studies have tested the POT using the rigorous techniques typically applied in larger firm studies. Most of the early researchers to test the POT in SMEs (Rajan and Zingales, 1995; Chittenden et al., 1996; Michaelas et al., 1999) among others have relied heavily on correlations among variables as empirical evidence of the Pecking Order in practice; for example, an inverse relation between profitability and leverage signals support for the Pecking Order. Leary and Roberts (2010) and Streubulaev (2007) argue that the predications of various leverage regressions have no power to distinguish between alternative

theories. Another problem with this approach is its inability to explain the dynamic nature of SME capital structure (Lopez-Gracia and Sogorb-Mira, 2008). As a result of these issues, there still remains some debate about theory and empirical findings. These issues have lead Myers (2001) to conclude that empirically, it is possible to find support for any of the capital structure theories.

To avoid these potential weaknesses, this research incorporates an approach to empirical measurement based on the original Shyam-Sunders and Myers (1999) and Lemmon and Zender (2010) methodology, which takes into account debt capacity constraints influencing financing behaviour and controls for firm specific individual unobservable effects which are found to significantly explain a large proportion of variation in leverage (Flannery and Rangan, 2006). In addition, while some studies do not explicitly take account of debt capacity, this study takes account of debt capacity for a sample of unquoted SMEs. Lemmon and Zender (2010) argue that financial distress costs and the issue of debt capacity (the extent to which firms can take on extra debt finance) are important in explaining capital structure decision making. This is critically important in SME financing research, as small firms are thought to have low debt capacities which influence their ability to take on debt financing. However, many studies do not account of this. Vanacker and Manigart (2010) find that for high growth companies, new equity issues are particularly important for SMEs to grow beyond their debt capacity levels.

Secondly, despite the lack of available data on SMEs internationally, there is a growing interest and demand for empirical studies on the financing behaviour of SMEs particularly since the onset of the financial crisis. This is the first panel study to examine the financing of SMEs in England, Ireland and Scotland, over

the crisis, based on financial accounts rather than SMEs opinion surveys. It examines whether the Pecking Order theory applies equally to SMEs throughout the crisis as in non-crisis periods. Since the onset of the financial crisis, SMEs have reduced their investments significantly and consequently, their demand for debt finance (BIS, 2012; Central Bank of Ireland, 2011).

The key question is what would we expect to observe for SME leverage over the economic cycle and furthermore during a credit crisis? If the Pecking Order holds, would we expect to see leverage fall over the economic boom as firms rely on profits and internal financing to reinvest or would the larger investment opportunities in boom times exceeding internally generated finance to invoke a positive relation between economic growth and SME leverage? Ultimately leverage will depend on a number of factors, including the cyclicality of the industry in which SMEs are located in (Gertler and Gilchrist, 1993) and whether the firm exhibits financial constraints or not (Korajczyk and Levy, 2003). Gertler and Gilchrist (1993) find that net debt issue for public and private large firms increase following a monetary contraction, while net debt and short-term debt issuances remain stable for small firms over the business cycle (Gertler and Gilchrist, 1994). To date, there has been little in the way of research on this complex issue, particularly for unlisted SMEs. As the findings presented in this research are drawn from financial statement data of SMEs in 3 regions over an 8 year period from 2004-2011, it is possible to identify the impact of the financial crisis. Panel data allows us to examine the dynamic behaviour of SME capital structure across regions and to identify both firm specific and regional effects, allowing us to ascertain changes in capital structure decisions of SMEs that a static empirical study cannot identify.

The paper is structured as follows: Section 2 and Section 3 contains a review of the Trade off and Pecking Order theory, from a theoretical perspective while also drawing upon existing empirical evidence for large and small firms. Section 4 discusses methodological approaches in existing research as well as the data and empirical methodology used in this study. Section 5 presents the results and discusses the findings, while section 6 concludes and provides extensions for further research.

2.2. Theories of capital structure

2.2.1 The Trade-off theory

The static trade-off theory was developed by Miller (1977) and Bradley, Jarrell and Kim (1984). It examines the role of leverage related costs in determining capital structures of firms. For example, the presence of debt tax shields reduce firms corporate taxes as debt financing increases all else equal. Debt tax shields increase the incentive for firms to issue debt, while the costs associated with financial distress or excessive leverage such as bankruptcy, penalties, agency costs and the loss of non-debt tax shields provide incentives for firms to use less debt financing (Kraus and Litzenberger 1973). Bradley, Jarrell and Kim (1984) assume that costs of financial distress are a function of firm earnings in which firm leverage ratios are inversely related to volatility of earnings. Their paper also incorporates personal taxes on equity which influence corporate borrowing. Theoretically, the static trade off model is a one period model which assumes that firms target an optimal capital structure. This optimal or target capital structure is reached by comparing the benefits and costs of the firm adopting additional units of debt. Firms adjust their capital structures towards a target

each period due to market imperfections. Recent literature has focused on a dynamic model of the Static trade-off approach, which tests the speed of adjustment of firms towards their target or optimal capital structure (see Flannery and Rangan 2006 and Huang and Ritter 2009)

The Static trade-off theory assumes that firms target an optimal capital structure. While it is a static/one period model, the empirical research assumes that firms revert back to their target capital structure. This target capital structure is difficult to define, since it is not observable, however, empirical studies measure the industry average capital structure over a number of years and this gives a prediction of the optimal target. In theory, if firms are past their debt capacity level they should reduce debt and revert back to their target ratio. Accordingly, capital structures are mean reverting.

Firms balance debt tax shields against the costs of excessive borrowing, such as financial distress costs resulting from the firm being unable to meet repayments and various other costs in the form of legal, administrative fees and reorganisation costs. While interest tax shields are likely to be significant for large firms, they may not be as important for small firms, since small firms' profits are not likely to be as great as large corporation profits and therefore face lower marginal taxes than large firms (Petit and Singer 1985; Michaelas et al. 1999). For these reasons, the incentives for small firms to take on debt for tax shield purposes are not as great as they are for larger firms. In this case, non-debt tax shields such as depreciation and investment tax credits may be important for observed capital structures of small firms. Scott (1977) argues that firms should issue secured debt, i.e. allowing the lender to secure designated assets in the case of default. He argues that even in the absence of corporate

taxes, issuance of secured debt can increase total firm value. For this reason, tangible assets are used in empirical studies to assess the relationship between tangible (collateral) and leverage. For small firms this is assumed to be an important determinant in accessing debt financing.

2.2.1 The Pecking Order theory

The work of Myers and Majluf (1984) among others have continued the debate on capital structure of firms and revived the earlier Pecking Order predictions explained by Donaldson (1961). Unlike the Trade-off theory which predicts that firms have an optimal capital structure in which they trade off the benefits of debt financing against the increased likelihood of financial distress as firms' leverage rises, the Pecking Order theory predicts a hierarchy of financing structure, and does not assume target debt ratios for firms. This theory suggests that financing decisions of firms are based on minimising financing costs and that observed debt ratios reflect the cumulative requirement for external finance (Myers and Majluf, 1984), therefore the financing deficit of firm is expected to be occupied by debt finance. A key contribution of the Myers and Majluf (1984) paper is the inclusion of the role of asymmetric information in influencing firm financing decisions.

Asymmetric Information

Asymmetric Information is often considered to be the most significant reason for the perceived cost difference between internal and external funds (Berger and Udell, 1998). Information asymmetries refer to the difference between insider and outsider knowledge regarding the prospects of the firm and how they value the firm, the value of the firm's assets in place and in the case of publicly

quoted firms, intrinsic versus the market price of the firm's shares. The Pecking Order theory assumes that firms prefer to finance their investments through the least costly way, i.e. through sources of finance least subject to information asymmetries and transaction costs. Empirically, studies often use volatility of firm earnings (Frank and Goyal, 2003), credit rating scores and firm size as proxies for information asymmetry. In this study, we include the variables tangible assets and volatility of firm earnings to indicate the role of information asymmetry on SME financing behaviour throughout the crisis. Firm managers also have greater knowledge about the future prospects of the firm and the firm's investment projects too.

When a firm faces an investment opportunity which requires them to seek external financing, they face a financing deficit. There is the possibility that they may pass up on a positive net value investment opportunity. The advantage of debt over equity financing however means that existing shareholders do not relinquish their share of ownership of exiting assets. This can be particularly important in the case of unlisted SMEs[8], whereby the SME is often motivated by the need to retain full ownership and full control of their business (Mac an Bhaird and Lucey, 2010; Watson and Wilson, 2002). According to Myers and Majluf (1984) the implications of asymmetric costs are that firms prefer to finance according to a Pecking Order, through internal finance first, followed by debt, and finally externally equity. External equity is used only as a last resort. Information asymmetries are also central to the differences in cost structures between large and small firms and are the basis of financing preferences.

[8] SMEs are characterised as employing between 10 and 249 employees(European Commission)

Some challenge the premise that the Pecking Order can only be derived by assuming asymmetric information (Frank and Goyal, 2003). Heaton (2002) derives the Pecking Order hypothesis using managerial optimism, in which managers believe that markets undervalue the firm's assets in place and the present value of the firm's investment opportunities. Managers may also have biased upward cash flow forecasts and expectations for the firm in which they are heavily personally involved. Myers (2001) and Leary and Roberts (2009) show, however, that agency conflicts arising from asymmetric information often account for the main source of Pecking Order behaviour among large firms. The focus of this research is on SMEs and the role of asymmetric information in limiting access to bank finance. Given that an overwhelming majority of SMEs do not use access finance on capital markets, we are implicitly differentiating between the problems encountered by large firms whose access to finance through capital markets may be limited by asymmetric information, and access to bank finance by SMEs. Using a survey of approximately 14,000 controlling financial officers, treasurers and controllers at over 8,000 US and Canadian companies, Graham and Harvey (2001) find that financial executives of companies are much less likely to follow academically prescribed theories such as the Pecking Order or Trade-Off theories when determining capital structure. Their results suggest that the assumptions and implications of such information asymmetries between investors and firm management that determine capital structures of large firms may have weaker explanatory power than existent academic literature would suggest. Specifically, Graham and Harvey (2001) find that few executives are concerned about the problems of asymmetric information.

Size

2.2.3 The Pecking Order and large enterprises

Size impacts on capital structure in a number of ways, therefore, it is necessary to distinguish between the size of enterprise and the form of financing structure. The association between firm size and leverage is of interest to many capital structure studies. As firm grows in size we would expect the firm to have greater levels of tangible assets, less risky and ultimately a positive relation between size and leverage. Empirically findings are mixed. Rajan and Zingales (1995) find a negative relation between size and leverage, while Margaritis and Psillaki (2007) find a non-monotonic relation between firm size and leverage, concluding that firm size may be acting a proxy for the inverse probability of default. There are number of plausible reasons why the Pecking Order is useful in explaining capital structure decisions of large enterprises. Firstly, in large enterprises, there is often a separation of ownership and control, not usually the case with SMEs. Secondly, large enterprises can accumulate significant retained earnings and often have greater scope to access external finance. Some time series analysis for large firms has shown results to be empirically consistent with the Pecking Order of financing (Shyam-Sunder and Myers, 1999; Fama and French, 2002), however these studies have been primarily based on samples of large firms with conservative debt ratios, unlikely to be hindered with financing capacity constraints. Empirically, findings of the Pecking Order are mixed for large enterprises. Shyam-Sunders and Myers (1999), Huang and Ritter (2009) and Lemmon and Zender (2010) all find support for the Pecking Order of different magnitudes, while Huang and Ritter (2009) finds that the explanatory power of the theory has fallen over time. Frank and Goyal (2003)

and Fama and French (2002), who do not control for debt capacity indicate little support for the Pecking Order. In addition to this, while rejecting the Pecking Order as first order descriptor of financing behaviour, Frank and Goyal (2003) find that large firms are more likely to follow the Pecking Order behaviour than small firms, contrary to Pecking Order predictions. When debt matures it is not necessarily replaced by new debt and leverage declines. Their research also points to the fact that SMEs which are publicly traded seem to opt for new equity issues instead of debt to meet their financing needs and in the 1990s greater proportions of small firms became publicly traded in the US, while also reducing their debt levels relative to equity. These issues beg the question as to the ability of the Pecking Order to explain SME capital structure decisions.

2.2.4 The Pecking Order and SMEs

Over the past decade, the Pecking Order theory has emerged as the key theoretical lens for explaining SME capital structure. Despite differences in opinion regarding the role of information asymmetries in driving Pecking Order behaviour, it is generally asserted that SMEs suffer from informational asymmetries and transaction costs (costs involved in issuing securities) to a greater extent than large firms (Lopéz-Gracia and Sogorb-Mira, 2008). In addition SMEs are generally unlisted. The costs associated with equity via IPO are greater for small enterprises (Schnabel, 1992; Chittenden et al., 1996). Uncertain cash flows and the lack of legal requirements to file financial statements as large, publicly traded firms are required to, means that in many cases the costs associated with improved financial accounting aren't affordable for SMEs. This is particularly in the case of unquoted SMEs, where there is little publicly available and reliable information regarding their assets,

liabilities, credit history and organisational behaviour upon which lending decisions are made. These issues can give rise to a problem of adverse selection, where banks often cannot differentiate between good and bad investment opportunities and ultimately do not finance either (Stanworth and Gray, 1991; Chittenden et al., 1996; Berger and Udell, 1998). When available, the quality of financial statements varies due to their prohibitive costs. Furthermore, institutional accounting standards and requirements vary across regions (Rajan and Zingales, 1995; Beck, Demirguc-Kunt and Maksimovic, 2008) and ultimately influence the availability and cost of finance for SMEs (Berger, 2006).

It is also believed that alternative sources of information provided by small firms are often inadequate and do little to minimise asymmetric information and agency costs (Petit and Singer, 1985) further increasing the costs of acquiring external finance. For many of the above reasons, SMEs are often considered to be more constrained financially than larger firms and often face higher interest rates too (Bass and Schrooten, 2006). In some regions they tend to use less external bank finance due to its relatively high cost (Beck, Demirguc-Kunt and Maksimovic, 2008). Accumulatively, there is an obvious preference to use the least costly source of finance, i.e. internal funds where possible.

One way to reduce information asymmetries is by developing a relationship with the provider of external finance. According to Ennew and Binks (1997), the longer a small firm spends doing business with a bank, the greater is the flow of information about the firm and its credit worthiness. Constrained access to financial and credit markets result in greater reliance on short term debt financing, internal funds and trade credit. For these reasons, observed capital

structures of SMEs vary depending on the age, size, industry sector in which the firm is based and stage of the life cycle perspective (Mac and Bhaird and Lucey, 2011; Gregory, Rutherford, Oswald and Gardiner, 2005; Berger and Udell, 1998). Research has shown that external equity is very important for high growth SMEs and particularly in the case of new high technology based firms (Hogan and Hutson, 2005). Table 2.1 below shows a summary of some the main pieces of literature and their support for the Pecking Order theory.

Table 2.1 Existing empirical studies testing the Pecking Order

Existing studies empirically testing the Pecking order theory		
	Sample and context	**Support for Pecking Order**
Large firm studies		
Lemmon and Zender (2010)*	CRSP and Compustat. US data	√
Huang and Ritter (2009)	CRSP and Compustat data	X
Frank and Goyal (2003)*	US Compustat data 1980-1998	X
Shyam-Sunder and Myers (1999)	Compustat Sample of US Firms	√
SME studies		
Mac an Bhaird and Lucey (2010)	Cross sectional sample of 299 Irish SMEs	√
López- Gracia and Sogorb- Mira (2008)	Spanish unquoted SMES 1996-2004	X
Watson and Wilson(2002)	Cross sectional sample of UK SMEs	√
Michaelas et al(1999)	Panel 3500 UK SMEs 1986-1995	√
Jordan et al(1998)	Sample of English SMEs < 100 employees	√
Chittenden et al. (1996)	UK private small firms	√
* These studies also draw data from small firms		

While costs are very important, other factors encourage Pecking Order behaviour, particularly by small firms. The reason SMEs follow the Pecking Order of financing is primarily due to the reluctance of management to relinquish control to outsiders and contentment with steady organic growth of their firm. Aversion to external equity can be more pronounced in small firms, particularly small family firms. These differences in attitude regarding control often emanate from the founders of the enterprise that aspire to grow further and expand the scale of their enterprise (Cressy and Olofsson, 1997). SME managers value financial freedom and in some cases they are averse to

substantial growth due to independence and lifestyle factors that motivate the manager and the small firm's behaviour.

SME size influences financing decisions by the ability of the SME to take on extra debt financing. In general, small, young firms are associated with small debt capacities and have smaller tangible asset bases than large firms. Larger firms generally have the ability to offer larger collateral guarantees on financing and have less chance of going bankrupt and tend to be more diversified (Titman and Wessels, 1988). It is also thought that debt capacity levels reflect the capacity of the firm to meet additional debt repayments (Vanacker and Manigart, 2010). SMEs are frequently owned and managed by one or a few people. For this reason, the transaction costs of external financing especially equity financing tend to be significantly higher for SMEs, as they have less organisational and management power in credit markets, compared to older larger established firms (Lopez-Gracia and Sogorb Mira, 2008). The next section presents the main predictions of the Pecking Order, 6 hypotheses have been derived that test the main predictions of the Pecking Order and Static trade off theories.

2.3 SME Capital Structure Hypotheses

Profitability

The Pecking Order predicts that firms will prefer to use retained earnings to finance investments, therefore SMEs will rely on retained earnings to finance investment opportunities as this is the cheapest form of financing for them. While many small firms have no debt in their capital structure, it is often the case that internally generated profits are insufficient to meet the size of their investments (Rajan and Zingales, 1995; Michaelas et al., 1999; Psillaki and

Daskalakis, 2008), therefore profits are negatively associated with debt financing up to a point. According to the static trade-off theory, a profitable firm would be expected to have higher levels of debt to offset corporate taxes; however we do not expect this to be likely in the case of SMEs, since many SME profits' are less profitable than large corporation profits and therefore face lower marginal taxes than large firms (Petit and Singer, 1985; Michaelas et al., 1999). For these reasons, we suspect the incentives for small firms to take on debt for tax shield purposes are not as great as they are for larger firms. However, it is noted that non debt tax shields such as depreciation and investment tax credits are important for observed capital structures of SMEs (Lopez-Gracia and Sogorb Mira, 2008).

H1: A negative relation between profitability and leverage is observed.

Industry sectors

Given the diversity of industry sectors SMEs engage in, it is important to recognise the effects that heterogeneity of industry sectors have on observed capital structures (Vanacker and Manigart, 2009). An important factor influencing the demand and supply of finance to SMEs is the level of information asymmetry which is closely related to industry affiliation. Often characterised as relatively opaque in nature (Berger and Udell, 1998), SMEs ultimately are associated with higher levels of information asymmetries compared to large firms. According to the static trade off theory, firms adjust to target capital structures, often measured as the industry average. As pointed out by Myers (1984), debt ratios vary from industry to industry due to asset risk, asset type and the need for external funds. Thus industry sector does appear to matter. Johnson and McMahon (2005) find that even after controlling for firm

characteristics such as size, age, profitability, and risk and asset structure, cross industry differences in SME financing behaviour do exist. In addition, Leary and Roberts (2014) show that smaller less successful firms are more sensitive to the financing decisions of larger more successful industry peers.

H2: Industry sectors with greater tangible assets to be positively related to the level of debt finance.

Growth opportunities

Small high growth firms are likely to have much larger growth opportunities relative to the assets of their firm in place (Hogan and Hutson, 2005). In addition, small high tech firms often issue equity due to their low debt capacity levels (Vanacker and Manigart, 2010). Conversely large firms are much less restricted by debt capacity constraints relative to small firms. As a result, when internal funds are exhausted, the use of external equity before debt financing does not contradict the Pecking Order theory for small firms (Lemmon and Zender, 2010). Carpenter and Peterson (2002) finds that growth of most small firms is constrained by the availability of internal finance and Hubbard (1998) finds that as debt financing increases, the probability of financial distress increases for firms affected most by information asymmetries, i.e. small firms in most cases.

It is also important to note that firms also have preference for financial slack and often do not want to restrict themselves in future investments, therefore, many firms do not borrow up to their debt capacity levels. For this reason the existence of growth opportunities may have a significant impact on actual debt ratios. Myers (1977) shows that highly levered firms with significant growth opportunities often forgo positive net present value investment projects. SMEs

with significant future growth opportunities maybe considered risky, especially if the SME has little in the way of tangible assets to use as a guarantee, therefore we would expect debt to be negatively related to the level of future growth opportunities. However, for SMEs who rely mainly on debt financing and have little access to other formal sources of external financing, which constitutes the majority of SMEs' external financing needs, future growth opportunities are also likely to be positively related to the level of debt financing depending on their debt capacity limits. This is observed empirically in a number of studies (Chittenden et al., 1996; Jordan et al., 1998; and Michaelas et al., 1999), while Lopez-Sogorb Mira (2008) find that firms with few growth opportunities and high cash flow should have a low level of debt.

H3: A positive relation between the level of growth opportunities and the level of debt financing is expected to be observed.

Age

Central to the Pecking Order is information asymmetries. As stated already, information asymmetries are assumed to be greater for smaller and younger firms (Ennew and Binks, 1997). Younger firms have are less likely to have an established reputation or track record in meeting financial repayments to lenders upon which potential information asymmetries are reduced (Rajan and Zingales, 1995). Thus it is likely that as the firm ages, information asymmetries are reduced, and there it is expected that a positive relationship between firm age and leverage will be observed. Alternatively, as the firm ages, they accumulate more retained profits and rely less so on external debt financing and more so on accumulated internal funds. As in Mac an Bhaird and Lucey (2010) older firms

are expected to have accumulated greater levels of earnings, whereas young firms will rely more on debt financing, and especially short-term debt financing (Chittenden et al, 1996). Age is expected to be negatively related to debt ratios.

H4: A negative relation between age and the level of debt financing.

Risk

From the perspective of the Pecking Order, a negative relation between SME risks (measured by volatility of earnings) and the level of debt is expected. However, this hypothesis is strongly rejected by Jordan et al(1998) More risky firms may try and lower the volatility of their profits by reducing their levels of debt, furthermore SMEs that are thought to be risky by banks may find it more difficult is accessing debt financing, in particular long term debt financing.

H5: A negative relation between risk and leverage is expected to be observed.

Non- debt tax shields (NDTS)

Many firms may have substantial tax shields other than interest payments on debt. These may include depreciation (Bradley et al., 1984) and investment tax credits. Increases in NDTS reduce the optimal level of debt; however empirical results can often suggest the opposite. Scott (1977) suggests that tangible assets that generate NDTS could also be used for collateral for additional debt, hence the empirical ambiguity. In this study, NDTS are measured as the ratio of depreciation to assets. Michaelas et al (1999) find a statistically significant positive relation between NDTS and the leverage of long term debt, while Lopez Gracia and Sorgorb Mira (2008) find that NDTS are negatively related to the level of debt for their sample of Spanish SMEs and attribute their findings to

Spanish SMEs taking advantage of higher investment tax credits and accelerated depreciation of fixed assets to reduce their overall tax burden.

H6: A positive relation between NDTS and leverage is expected.

Economics conditions and the trade cycle

The economic environment is likely to influence the level and availability of access to external finance for SMEs. According to Michaelas et al (1999), debt ratios will vary over the economic cycle. In times of better economic conditions, it is easier to raise debt financing, thus more opportunities for SMEs to raise long term debt finance, while as the economy grows, retained profits accumulate and high levels of short term debt from the recession are paid off. Thus SMEs rely less on short term debt as the economy grows and more so on long term debt financing. Korajczyk and Levy (2003) find that macroeconomic conditions account for 12-51% of the time series variation of firm leverage of a sample of listed firms, while Gertler and Gilchrist (1994) argue that small firms contract substantially more so relative to large firms during periods of tight money and ultimately face more liquidity constraints due to the fact that small firms tend to be more heavily concentrated in industries that are cyclical in nature. Therefore for these reasons, the following is expected.

H7: A positive relation between the level of debt financing and economic growth.

According to the information available, there are no clear theoretical predictions indicated by the Pecking Order or any other theory regarding the changes in the

level of long-term and short-term debt finance and the growth in the general economy. However one can speculate that over the observed time period. All three regions experienced an easing and expansion in the level of bank lending to SMEs (BIS, 2012; Central Bank of Ireland, 2012). Michaelas et al. (1999) examine this for a sample of UK SMEs aged 10 years or over from 1986 to 1995 and for the reasons outlined above predicted a positive relation between long term debt finance and growth and an inverse relation between short-term debt and growth, however González and González (2014) find that changes in long-term and short-term financing depend on the level of banking liberalization and firm size. The following hypotheses are tested on a sample of unquoted SMEs over the period 2004-2011. Quoted SMEs have more financing options available to them and lower information asymmetries (Berger and Udell, 1998).

H8: Long term debt finance is expected to be positively related to economic growth.

H9: Short-term debt finance is negatively related to economic growth[9].

2.3 Methodology

Shyam-Sunders and Myers (1999) initially introduced the flow of funds identity to test the Pecking Order theory, in which a firms' financing deficit is captured by the difference between cash inflows and outflows such as investments of the firm. The difference between the investment needs of the firm and internally generated funds should be accounted for by debt financing in the first instance according to the Pecking Order. The Pecking Order has also been empirically tested using leverage regressions (Michaelas et al, 1999; Lopéz-Gracia and

[9] A list of the hypotheses findings from prior research are included in the Appendix in Table A.21

Sogorb-Mira, 2008), by regressing firm debt against the main factors influencing financing behaviour. These factors generally include age, size, profitability, net debtors, growth opportunities, asset structure, depreciation and industry sector. As noted in Myers and Majluf (1984) the problem with these types of leverage models is that debt dominates unless there are significant costs associated with debt financing and ultimately they are less effective in rejecting the Pecking Order over other theories of capital structure. Another problem with these approaches, in particular, is the inability to control for the level of debt capacity of different firms (Lemmon and Zender, 2010) and endogeneity among variables.

Debt capacity

Different types of firms, small and large have different debt capacities; therefore if small or high growth firms are more restricted by debt capacity, they will require external equity to finance their growth opportunities and investment needs at a much earlier stage. Due to differences in debt capacity between small and large firms, it is likely that small firms would use less debt and more equity and other sources of finance. Measuring debt capacity is difficult. Small firms often have less information on lending histories and bond ratings. Frank and Goyal (2003), Rajan and Zingales (1995), Leary and Roberts (2010) and Lemmon and Zender (2010) specify debt capacities as a function of firm characteristics such as assets, market to book value debt, profitability and tangibility, while Vanacker and Manigart (2010) use leverage measures such as total debt to total asset ratios and cash flow to assets ratios as proxies for debt capacity. Internally generated cash flow indicates a firm's ability to make additional debt repayments. Other predictors include a measure of tangible

assets used by Cotei and Farhat (2009). The rationale here is that tangible assets are expected to be associated with higher debt capacity and lower costs of financial distress.

The flow of funds regression[10] used in this study explicitly shows the proportion of the financing deficit being filled by debt financing in each period. Using this methodology, we can analyse what proportion of SMEs' financing deficit is occupied by debt financing for a sample of English, Scottish and Irish SMEs. The financing deficit is used to establish the difference between firms' investment needs and internally generated funds. Firms constrained by the level of debt financing they can take on (their debt capacity) often have significantly low debt ratios, where an additional unit of debt financing is prohibitively expensive. Firms with high debt to value ratios and low cash flow ratios have limited debt capacity and therefore require external equity.

Shyam-Sunders and Myers (1999) take real investment as exogenous, and test the hypothesis that if firms face a financing deficit they first of all resort to debt financing to test the Pecking Order hypothesis. In this regression debt is increased or decreased depending on whether investment requirements exceed internally generated finance. According to the Pecking Order hypothesis, when a firm's internal cash flows are inadequate for real investment and dividend commitments, the firm issues debt.

Equation 1 Flow of funds identity

$$\Delta D_{it} = \alpha + \beta_{po} DEF_{it} + \epsilon_{it} \quad (1)$$

[10] The flow of funds regression is explained in the empirical model section of this study, specifically equation 1 and equation 1.1 in the section.

Where ΔD_{it} is the first difference of the ratio of total book debt to assets for firm i and DEF_{it} is the financing deficit and ϵ_{it} is the error term for firm i in period t. The closer the coefficient β_{po} is to one then the variation in debt over the year is mainly explained by the financing deficit, which is the prediction of the Pecking Order.

The financing deficit used in equation (1) is generally defined by

Equation 1.1 Capturing the financing deficit

$$DEF_{it} = \frac{\%\Delta \text{Assets}_{\text{it}} - \%\Delta \text{Retained earnings}_{\text{it}}}{\text{Assets}_{\text{it=1}}}$$

where %Δ represents percentage change

(1.1)

Huang and Ritter (2009) define net debt as the change in book debt as a percentage of the beginning of the year's assets and the financing deficit as the change in assets minus the change in retained earnings as a percentage of the beginning of the year assets.

Frank and Goyal (2003) compare the results for a balanced and unbalanced sample of firms and attribute the support of the Pecking Order in the Shyam-Sunders and Myers (1999) study to a balanced sample made up of mainly large firms. Accordingly, the inclusion of the smaller firms and firms with lower debt capacities significantly reduces the β coefficient on the financing deficit.

Shyam Sunders and Myers' regression illustrated in equation (1) ignores the degree of information asymmetry; firm's debt capacity, equity market conditions and other firm characteristics that affect the amount of debt a firm can issue (Cotei and Farhat, 2009). Results show that the theory performs better among large firms with moderate leverage as in the case of Shyam-Sunders and

Myers (1999) and Frank and Goyal (2003). It is likely that high growth SMEs or young firms constrained by debt capacity and access to debt financing are more likely to seek external equity to finance investment projects. Despite the potential weaknesses outlined, this approach does show how changes in the level of debt respond to changes in firm financing deficit.

Under the Shyam-Sunders and Myers financing flow identity above, irrespective of the size of the deficit, the financing deficit is covered with debt (Chirinko and Singha, 2000). The equation (1) specifies that the change in debt is a linear function of the financing deficit. Under this approach it assumes that debt changes dollar for dollar with the financing deficit. Lemmon and Zender (2010) incorporate a nonlinear function of the financing deficit into the above equation to illustrate the role of debt capacity in financing. They propose a modified empirical approach that controls for debt capacity. By doing this, the Pecking Order gives a good description of financing behaviour for firms.

For smaller firms with low debt capacity levels, it is likely that the financing coefficient will be biased downwards and the greater the deficit, the more likely this will be covered by issuing debt and equity. Lemmon and Zender (2010) correct for this bias by adding a squared coefficient to the functional form of the regression. This allows the regression to capture the concave nature of the relation between the financing deficit and net debt issuance. For large firms or firms that are unconstrained by debt capacity issues, little difference is expected to be found between the two coefficients shown below.

Equation 2 The modified flow of funds identity

$$\Delta D_{it} = \alpha + \beta_{po} DEF_{it} + \gamma DEF_{it}^2 + \epsilon_{it} \quad (2)$$

Under this modified flow of funds regression, for firms with low debt capacities, or small firms, the coefficient γ is expected to be negative, while βpo is positive and less than one which is the prediction of the standard Pecking Order.

The above methodology incorporates both current operating profits and costs and investment financing needs. The regressions treats the issue of investment needs as exogenous and incorporate both firm requirements for investment needs and operating needs. In this case, firms will experience a financing deficit if internally generated funds cannot cover this deficit. In examining the financing decisions of firms after short-term changes in profits and investments, Lopez-Gracia and Sogorb–Mira (2008) test the Pecking Order by regressing firms' debt against factors that summarize behaviour of the Pecking Order approach, similar to Jordan et al (1998) and Michaelas et al (1999).

2.5 The data

The data consists of SME[11] financial data taken from the FAME database for the period 2004 to 2011. Data contains information on SMEs for 3 regions, England, Ireland and Scotland and a total of 5,514 unlisted SMEs, of which; 4,170 are located in England, 691 are located in Scotland and the remaining 653 firms in the sample are Irish. The sample includes a total of 46,650 observations, 34,801 on English SMEs; 6,365 on Scottish SMEs and 5,484 on Irish SMEs. The data is the most comprehensive available on financing in these regions and the study represents the first panel study in these regions since Michaelas et al (1999). However, the claim is not made that the sample is representative of the regions in the ultimate sense.

[11] http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm

SMEs are defined according to the European Commission (2005) criteria and include firms which employ less than 249 workers in a given year and have either an annual turnover of less than €50m or a balance sheet total of less than €43m. In this study, we scale by the number of employees and the balance sheet totals of each SME in each year. The criteria for my sample are as follows:

1) All firms employing between 2 and 249 employees in each of the sample years.
2) All firms with balance sheet total of greater than 43,000,000 in any of the sample years are excluded.
3) Firms that are reported to be listed or delisted are excluded.
4) The analysis excludes all financial and insurance companies, in line with existing empirical studies.
5) All financial variables are winzorised at the 1% and 99% level. This is to mitigate the effect of extreme outliers in the data. The data excludes subsidiary firms.

Micro enterprises are included in the sample and represent over 1,100 in any year, while small represent over 1,500 firms and the remainder are medium in size[12]. It is important to note that this is a highly stratified sample and few researchers have applied such criteria to SMEs. The effect of this is to reduce the sample size of this study significantly[13].

[12] The proportion of the sample that is categorised as micro, small or medium varies slightly depending on the year.

[13] Original sample of SMEs, as defined by employees contained a total of 6147 firms, scaling by the additional criteria of assets reduced sample size to 5,519. The Irish sample is based on unlisted SMEs (average age of 17 years). More than half of the SMEs in the Scottish sample are of medium size with an average number of 86 employees. While the sample of English SMEs contains a median number of 44 employees and a mean number of 57 employees, with an average age of 21 years.

Using financial data, the financing deficit is calculated as the change in assets minus the change in retained earnings as a percentage of beginning of year's assets, following Huang and Ritter (1999). Table 2.2 below contains a list of variables used in this study. Data on all firms are recorded according to their Nace Rev 2. 2007 codes. In all, a total of 13 different industry sectors are analysed[14]. It is important to note that the data for Irish firms is not as plentiful as for Scottish and English firms and this has restricted the analysis on the differences among industry sectors for the Irish sample as a whole). Also data on the number of employees each year in the Irish sample are weak. Unfortunately, given data restrictions, it was not possible to explicitly measure the relative cost of equity financing as in Huang and Ritter (2009), however a proxy for growth opportunities calculated as intangible to total assets (Caneghem and Campenhout, 2010; Margaritis and Psillaki, 2007 and Michaelas et al., 1999) and a dummy variable for SME ownership are included. However neither of these variables are statistically significant.

[14] See Appendix A.1 for nace code descriptions

Table 2.2 Variable names and descriptions

Variables	Description
Total assets:	Calculated as the sum of fixed and current assets
Total debt:	Calculated as the sum of long and short term debt and overdrafts outstanding in a given period.
Change in total debt:	This refers to the change in total debt outstanding as a percentage of the beginning of year firm assets.
Tangibility:	Calculated as the ratio of fixed to total assets.
Financing deficit (Deficit):	This is calculated as the change in firm assets minus the change in retained earnings as a percentage of the beginning of year firm assets.
Financing deficit squared:	This refers to the squared value of the financing deficit.
NDTS:	A proxy for non-debt tax shields, calculated as the ratio of depreciation to total assets.
O'ship:	A dummy variable indicating if the SME is 100% owned.
Profitability	The change in earnings before interest and tax scaled by assets
Growth opportunities:	A proxy for growth opportunities calculated as the ratio of intangible to total assets.
Long- term debt	Ratio of long-term debt to total assets
Short-term debt	Ratio of short-term loans and overdrafts to assets
Growth GDP/ PC	GDP per capita growth in percentage terms
Source FAME and World Bank	

Table 2.3 below present the summary statistics for the sample as whole over the period 2004-2011, while table 4 presents the correlation coefficients of the main variables of interest included in the research.

Table 2.3 Summary statistics for Irish and UK SMEs 2004-2011[15]

Variable	Obs	Mean	Std. Dev.	Min	Median	Max
Total assets	46,650	8,024,734	8,281,496	11823	5,700,000	43,000,000
Log total assets	46,650	15.3	1.85	9.38	15.7	19.3
Total debt	18,325	3,204,479	4856590	10047	1,600,000	77,600,000
Deficit	46,650	5.02	31.5	-89.5	2.6	244
Deficit squared	46,650	1250	4858	0.02	142	81327
Firm age	46,650	26	21	1	20	141
number of employees	43,093	60	54	1	45	249
Log age	46,650	3.0	0.76	0	3.0	4.9
Annual GDP per capita growt	46,650	0.2	2.6	-8	1	3
EBIT	46,572	0.03	0.42	-3.1	0.07	2.7
longtermdebt	19,598	1,660,231	3,414,977	1236	510,000	65,300,000
Tangibility	46,650	0.32	0.29	0	0.23	0.98
Growthopps	6,927	0.08	0.14	-0.03	0.02	1.6
Turnover	38,579	13,500,000	16,000,000	7916	8,800,000	100,000,000
Short-term debt	35,023	1,763,086	3,633,311	214	540,000	78,600,000
Change in total debt	16,536	0.79	14.8	-46.2	-0.8	96.0
Total debt ratio	18,325	0.3	0.3	0	0.3	2.0
longtermdebt ratio	19,598	0.2	0.3	0.0	0.1	2.0
Short term debt ratio	35,023	0.2	0.3	0.0	0.1	1.8

All values are quoted in Euros

Table 2.4 Results of correlation coefficients of variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Change in total debt	1							
(2) Financing deficit	0.5662	1						
(3) Financing deficit squared	0.3037	0.4206	1					
(4) Log profit assets ratio	-0.0894	0.0031	-0.0196	1				
(5) Log age	-0.0315	-0.091	-0.1297	-0.0093	1			
(6) Log tangibility	-0.0122	-0.0383	-0.0645	-0.0268	0.1138	1		
(7) ndts	-0.0323	-0.0295	0.0138	0.0098	-0.0154	0.1101	1	
(8) Country	0.004	0.0114	0.0105	-0.0594	-0.0139	0.0914	0.0182	1

2.6. Empirical analysis

The following contains two forms of regressions shown in equation 3 and equation 4 below. The first equation is based on the original Shyam-Sunders and Myers (1999) method to test the Pecking Order. This equation models the flow of funds deficit and tests how much of firms' financing deficit is occupied

[15] Please see Appendix from Chapter 2 (Tables A.3.1, A.3.2 and A.3.3) for individual region summary statistics

by debt financing. According to the Pecking Order, debt financing is the preferred choice of financing after retained earnings, therefore the slope coefficient β_{PO} is expected to be close to one in equation 3. The second regression is based on the Lemmon and Zender (2009) modification which captures the role of debt capacity constraints influencing firm financing behaviour. It is expected that SMEs and particularly small firms to suffer from debt capacity constraints to a greater extent than large firms due to the expected information asymmetries associated with this cohort of firms. Equation 4 includes the variable of the financing deficit squared as an additional regressor plus control variables. The following control variables of firm age, tangibility, profitability proxy and industry sector dummies and country specific controls e.g. GDP per capita growth. These control variables have been indicated in the literature (e.g. Rajan and Zingales, 1995 and Frank and Goyal, 2003) to be influences on firm leverage. These include ltangibility (log ratio of fixed to total assets), lprofitability (log profit to assets ratio) and lage (measured as the log firm age), ownership dummy, growth opportunities and a proxy for non-debt tax shields (depreciation to total assets).

According to the Pecking Order, a positive relation between tangibility and level of firm debt is expected and negative relation between profitability and debt. More profitable firms are expected to choose internal financing to fund their financing gap according to the Pecking Order, however the static trade off suggests the opposite. Previous studies have found an inverse relation between these two variables (Fama and French, 2002; Mac an Bhaird and Lucey, 2010) and a negative relationship between age and leverage (Mac an Bhaird and Lucey, 2010). It can also be argued that older firms due to the accumulation of

funds over time require less borrowing. Asset tangibility is included and this indicates that firms with greater tangible assets should suffer less information asymmetry constraints when accessing debt finance, so therefore a positive relationship between this variable and the change in net debt will be observed. To overcome any potential problems with skewness in the independent variables, the logs of tangibility, age and profitability are included in regressions[16].As outlined above, all data in this study is restricted to SME criteria. A Hausman test was conducted and this showed in favour of the fixed effect regression over random effects.

Equation 3 Modified flow of funds with control variables

$$(3)\ \Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + \beta_1 lage_{it} + \beta_2 \sum industry\ sectors_{it} + \beta_3 ndts_{it} + \beta_4 ltangibility_{it} + \beta_5 lprofitability_{it} + \mathcal{E}_{it}$$

Equation 4 Modified flow of funds with debt capacity

$$(4)\ \Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + \gamma DEF_{it}^2 + \beta_1 lage_{it} + \beta_2 \sum industry\ sectors_{it} + \beta_3 ndts_{it} + \beta_4 ltangibility_{it} + \beta_5 lprofitability_{it} + \eta_i + \eta_t + \mathcal{E}_{it}$$

As a robustness check, the results obtained from the flow of funds identity equations are compared with an estimated model of trade off theory. While, for the reasons outlined thus far, the main source of interest is to estimate the performance of the Pecking Order, the Trade-off theory may give some insight into whether SMEs are likely to move towards a target level of leverage. The proposed model of the Trade-off is demonstrated in Equation 5.

[16] Appendix Figure A.2 includes table of the mean and median values of dependent and independent variables on yearly basis.

Equation 5 Trade-off model

$$\frac{\Delta D_{it}}{TA_{it}} = \alpha + \beta_{TA} \frac{D^*_{it} - D^*{}_{it-1}}{TA_{it}} + \cup_i + \varepsilon_t$$

Whereby $\frac{\Delta D_{it}}{TA_{it}}$ is the first difference of total debt scaled by total assets. D^*_{it} represents the target level of debt for firm i at time t. The trade-off theory predicts that as $\beta_{TA} > 0$ firms move towards their target, however there are adjustment costs. Variations of this model are regressed and results are provided in Table 2.6

2.7 Findings

The sample period 2004-2011 covers a time of significant change for SMEs. In this sample as a whole, it is observed that average sales and retained earnings of SMEs were rising steadily, as well as short and long term debt level until the crisis of 2008. Debt ratios fall in the last years of the sample. The results show significant change over the years of the sample period.

Table 2.5 Results of panel regressions

Results of panel regressions[1]

[1]Dependent variable: Net debt issued as a percentage of beginning of year assets.
The regressions include year dummy variables and industry dummy variables. Relevant industry sector codes are shown in Appendix Table A.1. ***, **, * indicate significance at 1%, 5% and 10% levels respectively. Figures without stars are not statistically significant. Standard errors are indicated with parenthesis.

Financing deficit		0.350***	0.332***	.333***
		.0101305	(.010)	(.004)
Defict squared		.0002*	.0002	0.001***
		.0000887	(.00)	(.001)
log Profit assets ratio		-1.54***	-1.636***	-1.645***
		(.121)	(.18)	(.157)
ndts		10.92***		
		(2.76)		
log tangibility		.511**	2.04***	2.202***
		(.12)	(.42)	(.332)
log age		-.05	.254	.725
		(.17)	(.70)	(.971)
Industry sectors			No	
	1	.486		
	2	-2.41		
	3	.365		
	4	.205		
	6	.199		
	7	.736**		
	8	.243		
	10	1.036		
	11	-.974		
	13	Omitted		
	14	-1.58		
	15	.991		
	16	-2.11		
Time Dummies				
	2004	Omitted		Omitted
	2005	1.06***		.760**
	2006	-.125		-0.481*
	2007	.456		0.142
	2008	.905*		0.097
	2009	-.117		-0.637
	2010	.233		-0.378
	2011	0.274		-0.259
Country effects			Omitted	
	Ireland	0.942		
	Scot	-.147		
Observations		13940	16105	14248
number of groups		3015	3200	3057
obs per group (average)		4.6	5.0	4.7
R-sq within		0.38	0.35	0.38
R-square between		.31	0.25	0.27
R-square overall		.37	0.29	0.35
rho* fraction of variance due to u		0.151	0.3405	0.379

***, **, * indicate significance at 1%, 5% and 10% respectively, figures without stars are statistically insignificant. Standard errors are signalled with parenthesis(clustered)

Table 2.5 shows the panel data regression analysis. In column one, the results for pooled OLS regressions are shown. These regressions in Table 2.5 are based

on equation 4 above. It is observed for the sample as a whole, the Pecking Order does a poor job of explaining the financing structure as a whole, with a coefficients estimate of just .350, while accounting for the nonlinear debt capacity relation. Interestingly, in Table 2.5, the coefficient estimate for asset structure (tangibility) is positive and the coefficient for profit to assets ratio is negative, both supporting the predictions of the Pecking Order. The industry sector of wholesale is the only sector to show statistically significant coefficient results. The results for age are mixed with negative coefficient sign in the pooled OLS regression and positive in the fixed effects regression, but neither is statistically significant. Results obtained from fixed effects and fixed effects with time dummies show positive relation with the dependent variable up to the crisis in 2008 and negative thereafter. By controlling for firm individual specific effects the results are broadly similar.

The inclusion of the time dummies allows us to view these results from the perspective of a business cycle where positive growth was observed in each of the three regions up until the latter years of the sample. Surprising in the above panel regression, while the time dummies during the crisis period are negative in sign, they are not statistically significant. Figures 2.1 and 2.2 below shows the estimated financing deficit coefficients β_{PO}. The figure shows the results of the estimated coefficient (β_{PO}) for both regressions for the cross-sectional regressions in the English and Scottish samples.

Figure 2.1 Financing deficit coefficients for English SMEs

Financing deficit coefficients taken from SMEs in sample. The solid line represents the yearly βpo coefficients from equation (3), while the broken line illustrates the yearly βpo coefficients from equation (4) for English SMEs.

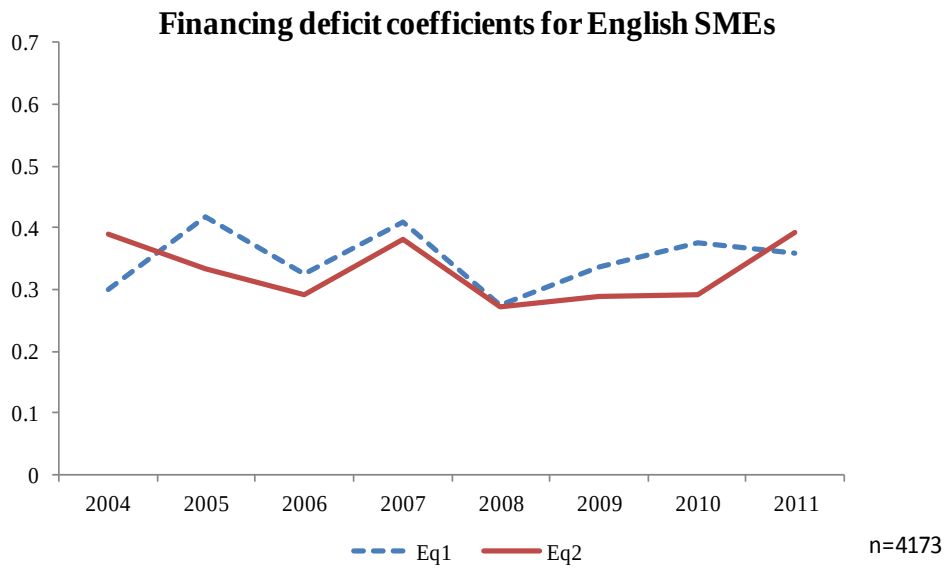
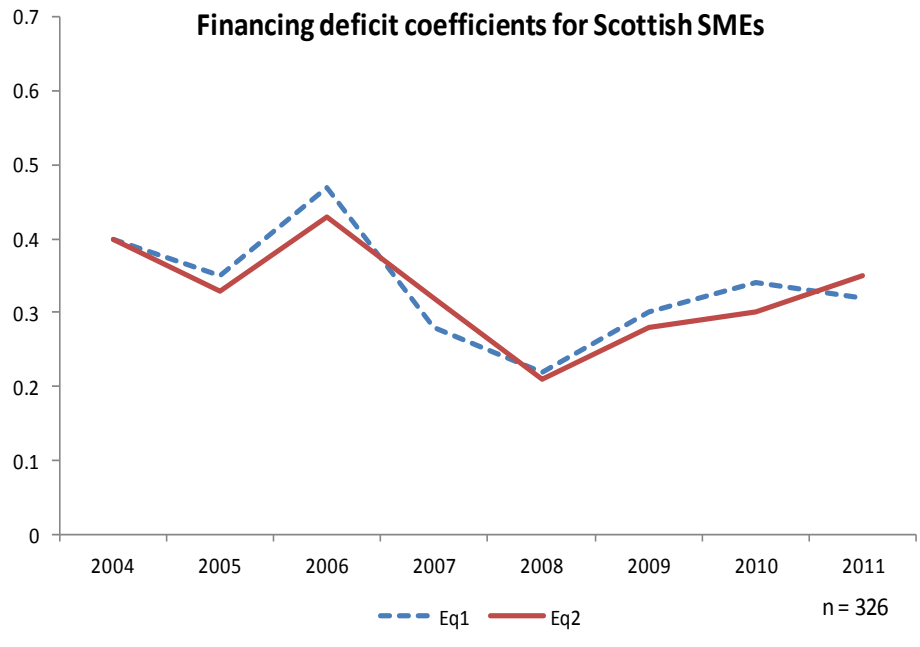


Figure 2.2 Financing deficit coefficients for Scottish SMEs

Financing deficit coefficients SMEs in Scottish sample[1] [1]The solid line represents the yearly βpo coefficients from equation (3), while the broken line illustrates the yearly βpo coefficients from equation (4) for Scottish SMEs.



The above figures illustrate the estimated β_{PO} values for the cross sectional regression with and without the additional deficit squared regressor. Figure 2.1 shows that overall coefficients have remained static over the period for English SMEs and in some respects have declined up to the year 2010. This indicates that particularly over the crisis years, English SMEs have been relying more so on alternative sources of finance, other than debt finance obtained from banks to fill their financing deficits. As observed for the sample of Scottish SMEs, the coefficients peak at .45 in Scotland in 2006 and .4 for English SMEs in 2006 and fall to .25 in year 2008. These coefficients support the findings of recent research that most SMEs do not use formal sources of external bank finance and instead rely on trade credit and retained earnings (BIS, 2012).

As illustrated in Table 2.6, a Trade-off model is estimated. The estimated coefficient betata or β_{TA} captures if SMEs move towards or away from their target level of leverage (the industry average). Therefore, if $\beta_{TA} > 0$ firms move towards their target, however there are adjustment costs. The results show differences when fixed effects are applied, with a negative coefficient being observed for pooled OLS and a positive coefficient observed for fixed effects regressions. Overall for pooled OLS results appear to indicate that for the sample as a whole, firms move away from their target leverage.

Table 2.6 Trade off model

Results of Panel regressions
Dependent variable is the first difference of total debt scaled by Total assets and **betata** is the beta coefficient on the difference between the target level of debt for firm i at time t minus the level of debt for firm i in the period t-1 scaled by firm assets**.**
Column 1 shows the regression results for equation 5 using pooled ols and firm fixed effects based on the target level of debt of the as the median level of total debt for the sample as a whole of the period 2004-2011.
Columns 3 and 4, the target level of debt are based on the median total debt of years 2003-2007(Pre-crisis) and years 2008-2011 (Post crisis).

Variable		Pooled OLS	Fixed Effects (FE)	Fixed Effects (FE)	Fixed Effects (FE)	Pre-crisis	Post crisis
Constant		0.533**	.321**	-4.100**	11.95*	22.02	7.82
		(.12)	(.12)	(.32)	(4.77)	(9.08)	(7.34)
betata		-.109***	.354***	.360***	.623***	2.47***	.28***
		(.03)	(.08)	(.08)	(.09)	(.24)	(.13)
Profit assets ratio					-6.35**	-5.42**	-9.88**
					(.96)	(1.64)	(1.42)
ndts					-73.28***	-1.66	-49.47*
					(6.2)	(12.9)	9.46
tangibility					5.13**	21.15**	-.653
					(1.87)	(3.4)	(2.7)
lage					-2.46	-7.17*	-.913
					(1.6)	(3.08)	(2.41)
Industry dummys		No	No	YES	YES	YES	YES
Time Dummies		No	No	YES	YES	YES	YES
Country Effects	Ire Scot	No	No	YES	YES	YES	YES
Observations		14093	14094	14224	13884	7993	7887
number of groups			3025	3042	3004	2632	2751
R-square overall		.01	.21	.23	.25	.38	.39
rho* fraction of variance due to u_i)							

The results in Table 2.6 appear that assuming a industry target level of leverage for SMEs, they appear to move more quickly towards this target level in pre-crisis years, while this movement is much slower in the post crisis years of 2008 onwards. The results in Table 2.6 also indicate that non debt tax shields (NDTS) and profitability are negatively related to firm leverage. These results regarding profitability do not support the predictions of the trade-off theory, yet the results of NDTS appear to support similar findings to Lopez-Gracia and Sorgorb Mira (2008), implying that investment tax credits may play a large part in SME financing decisions.

The following Figures 2.3, 2.4 and 2.5 illustrate the change in total debt of the sample of SMEs in each of the region and its relation with changes in their financing deficit/ surplus. For the Pecking Order to be successful, the graphs

below should show that the change in debt financing tracking the financing deficit as predicted. Debt trends up in times of deficit and down in times of surplus, as explained by Myers (2001).

Figure 2.3 Changes in debt ratios versus the financing deficit

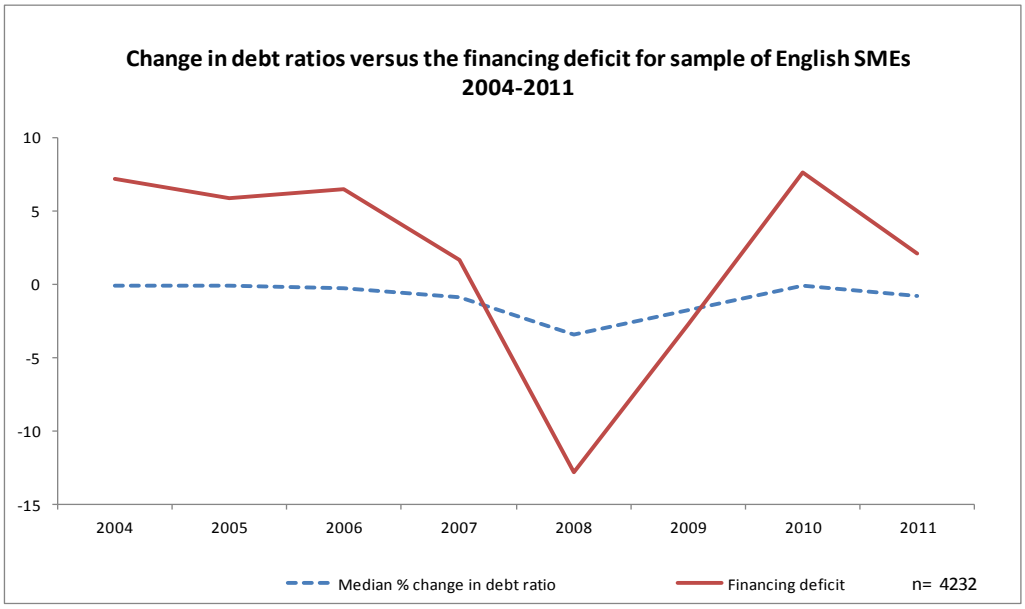


Figure 2.4 Changes in debt ratios versus the financing deficit for Irish SMEs

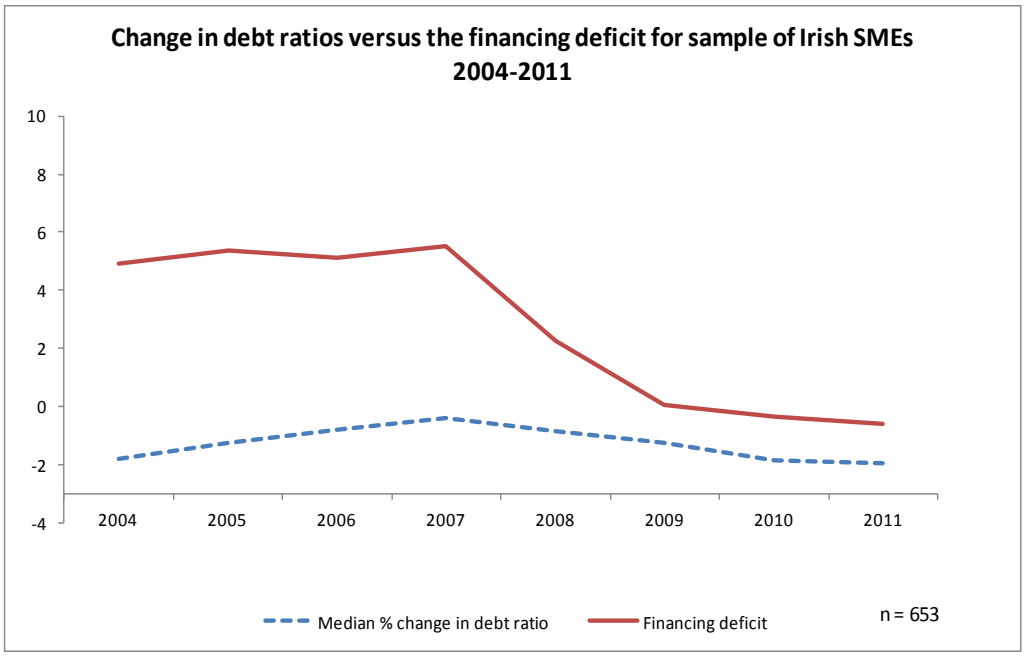
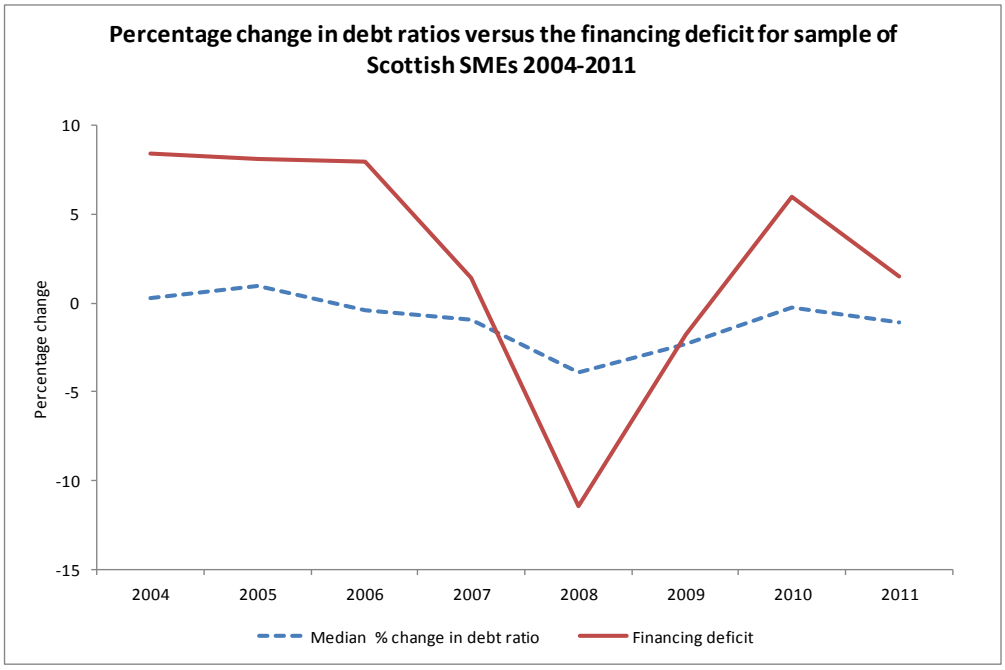


Figure 2.5 Changes in debt ratios versus the financing deficit for Scottish SMEs



The above illustrations indicate a period of time in which the majority of sampled SMEs are running financing deficits for the years of 2004-2007. These graphs indicates a significant change in SME financing behaviour during sample time period. It suggests that firms' behaviour changed from running financing deficits to surpluses when the financial crisis began to occur. This suggests a dramatic cut in outgoings and investments over this period[17]. Noticeably, during the 2007/08 period, firms are deleveraging, allowing them to survive turbulent times. These firms may also be unable to borrow finance and have been forced to repay past borrowings. These events coincide with the changes in economic growth and investment in each region.

[17] It important to note here that the observed sample is based on an unbalanced panel, therefore it is also likely that many firms who were running deficits may have fallen out of the sample due to business failure, therefore, there may be an element of bias in the final years of the sample graph towards surviving SMEs.

In figure 2.4, over the period 2004-2006, in general, a steady increase in the measure of the financing deficit for Irish SMEs is observed reflecting official data which show this to a period of sustained economic growth and increased investment (Central Statistics Office, 2011). For the Irish data, this reflects a period in which Ireland was characterised by a rapid expansion in both the level of investment and the level of credit availability (Central Bank of Ireland, 2001) until the financial crisis. Thereafter, total investment in the Irish domestic economy fell by over 52% during the period 2008-2011 (Central Statistics Office Ireland, 2011).

Both the level of sales and the value of assets rose steadily for Irish SMEs. For the sample as whole, the level of retained earnings peaked in 2005 for Irish SMEs and in 2007 for English SMEs, and falls steadily thereafter. This fall off in retained earnings is more dramatic in the case of the sample of Irish SMEs. While levels of short-term and long-term debt financing are relatively stable over the sample period for English and Scottish SMEs, there is a steady and persistent increase in the levels of debt financing for Irish SMEs. This is consistent with a period in which the demand and supply of debt financing, as well as the level of investment among SMEs increased dramatically in the Irish economy until the recent crisis. Figure 2.6 illustrates the change in investment and real GDP growth over the sampled years.

Figure 2.6 Total investment as a percentage of GDP: Ireland and UK

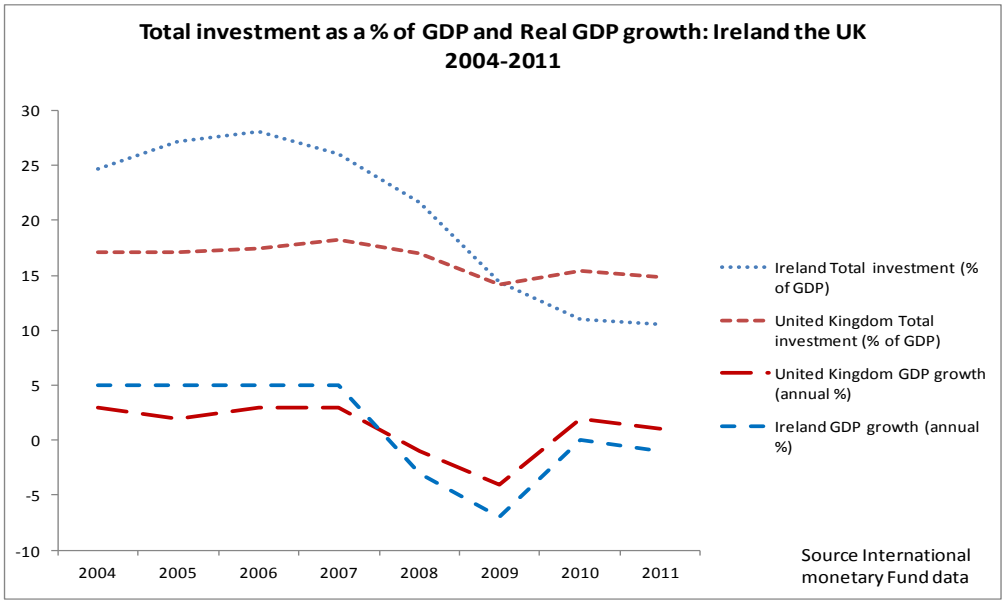


Figure 2.7 below illustrates the changes in debt financing for the sample. Hall et al (2000) and Chittenden et al (1996) evaluate short and long term debt financing separately. They purport that total debt holds two separate effects for long and short term debt financing for some of the explanatory variables (asset structure, size and growth). Both long and short term debt financing have differing motivations, needs, costs and availability. In this study we examine the relationship between these variables across the explanatory variables of age, growth opportunities, profitability and macroeconomic conditions (captured by GDP per capita growth). Figure 2.7 illustrates the ratios for the sample of SMEs as a whole. The ratio of short-term debt to total financing is declining over the period of economic expansion (2004-2007), supporting the predictions of Michaelas et al. (1999). In addition, when splitting the sample by age, long term debt ratios appear to be rising significantly for SMEs of less than 10 years in age.

Figure 2.7 Debt ratios for sample of English, Irish and Scottish SMEs over period 2004-2011

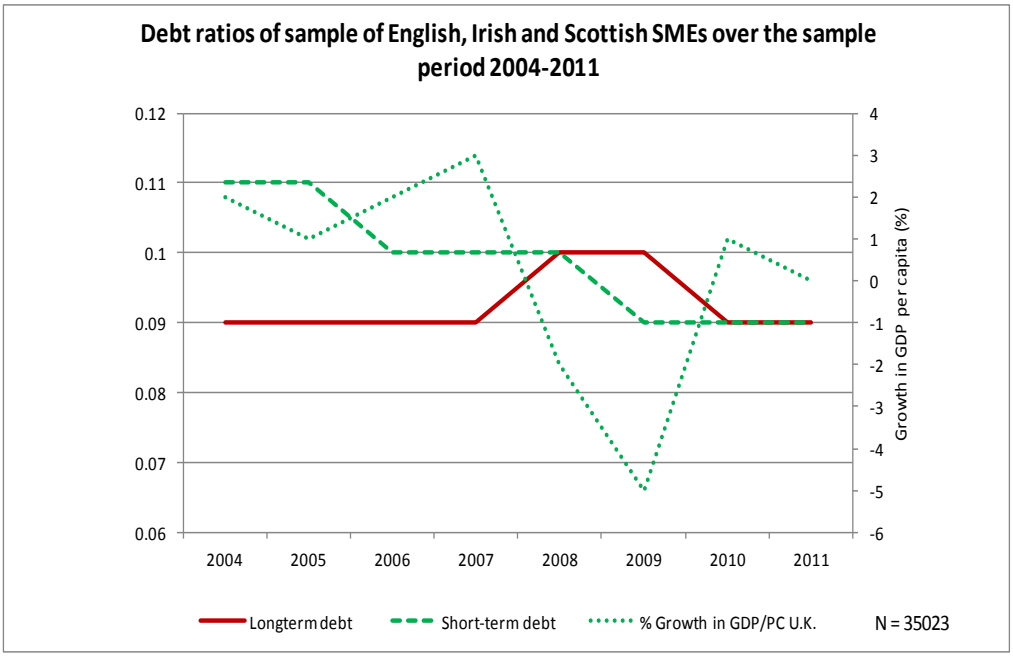


Figure 2.8 Changes in aggregate levels of debt finance for small firms

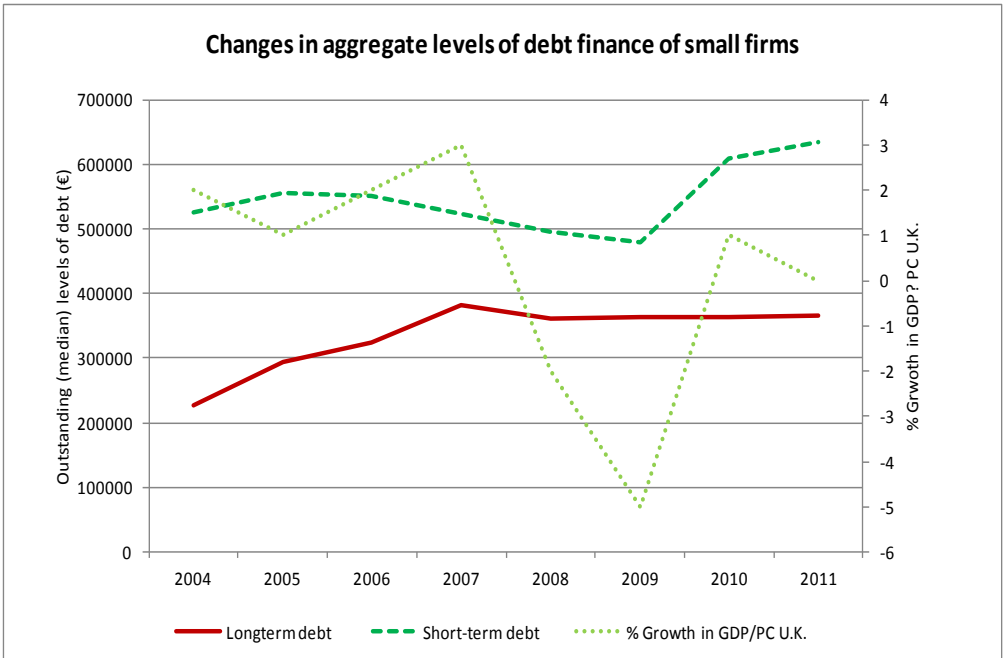
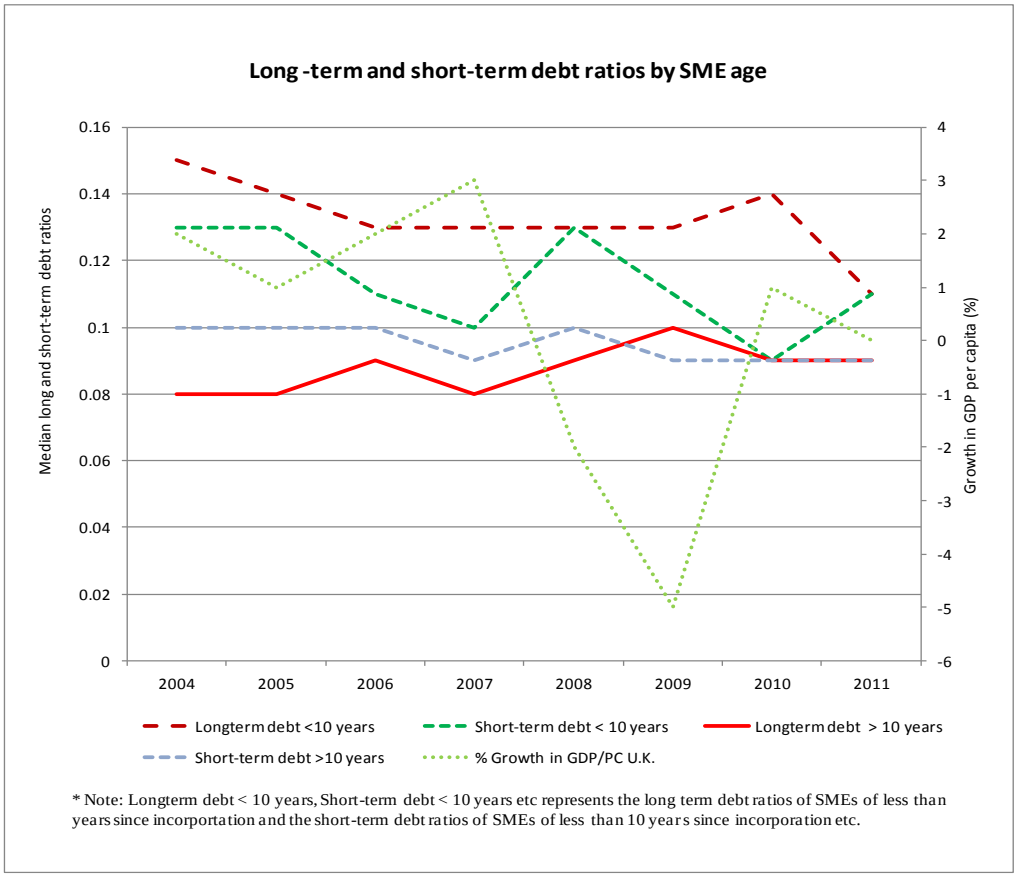


Figure 2.9 Long-term and short-term debt ratios by SME age



The findings from regressions in Table 2.7 support the findings of Hall et al (2000) and the predictions of the Pecking Order regarding profitability, age, growth and asset structure, the sample of SMEs do exhibit falling short term debt ratios of the sample period as a whole. While this is similar over the years of economic growth (2004-2007) to the inverse relation observed in Michael et al (1999), it is unlikely to be for the same reasons as there were a number of years of sustained economic growth prior to 2004. It is interesting to note that long-term debt ratios are consistently rising for SMEs of less than 10 years in age over the sample period and falling for the rest of the sample of greater than 10 years in age.

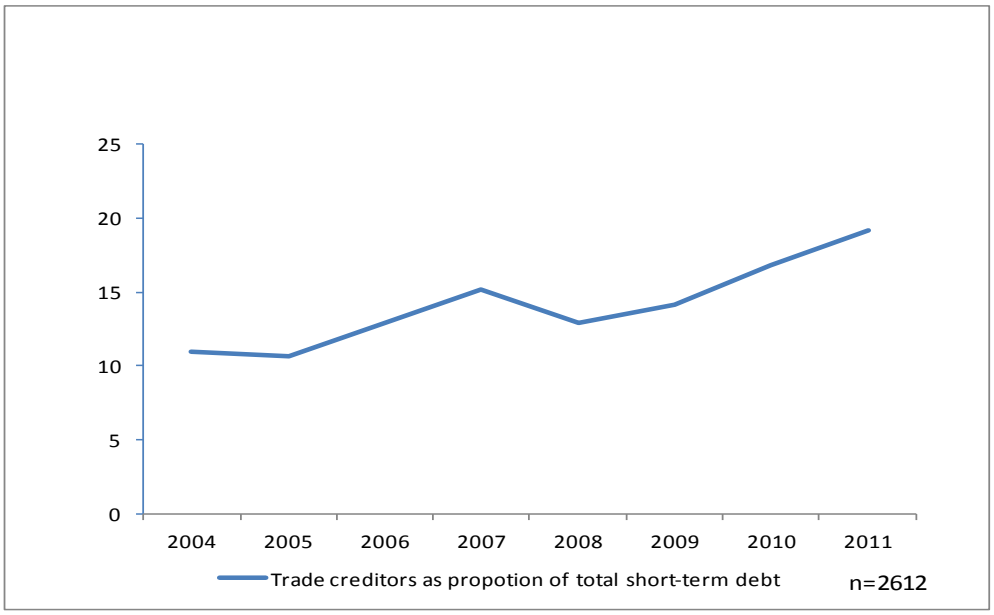
Table 2.7 Sources of debt panel regressions

Variable	Dependent variables		
	Total debt	long-term debt	Short-term debt
Constant	.361***	.264***	.273***
lage	-.049**	-.061***	-.022
	(.03)	(.02)	(.01)
Profitability	-0.215***	-0.04***	-0.104***
	(.07)	(0.01)	(.01)
Growth Oppertunities	-.156**		
	(.08)		
Risk	-.790***		
	(.074)		
Tangibility	.268***	.252***	.017
	(.06)	(.03)	(.02)
Growth GDP/ PC	.012**	.005	.003
	(.00)	(.01)	(.002)
Time Dummies			
2004		Omitted	Omitted
2005		0.02	.003
2006		0.01	-.010*
2007		0.01	-.019***
2008		-0.01	-.002
2009		-0.02	.007
2010		0.01	-.008
2011		0.01	-.006
Observations	4,050	18,880	33,851
number of groups	900	3571	5,343
obs per group (average)	4.5	5.3	6.3
R-sq within	.10	0.04	.03
R-square between	.09	0.07	.03
R-square overall	.10	0.1	.05
rho* fraction of variance due to u_i)	0.8	0.810	.724

***, **, * indicate significance at 1%, 5% and 10% respectively, figures without stars are statistically insignificant. Standard errors are signalled with parenthesis(clustered)

Finally, as regards changes in short-term financing over the sample period, I examine sources of informal finance by illustrating the increased importance of trade finance. In figure 2.10, I illustrate the increased importance of accounts payable in the short-term financing for SMEs over the sample period.

Figure 2.10 Trade payables as a proportion of total short-term debt financing



2.8 Conclusions

Although the research provides empirical evidence on capital structures of SMEs, the main aim of this study is to test the Pecking Order theory using the modified flow of funds regression technique over the business cycle. The study is the first of its kind to test the Pecking Order using this approach on Irish, English and Scottish SMEs. This and the time span of the panel are important as the cost structures and the availability of external finance, particularly debt financing changed significantly over this period. While the research finds that the Pecking Order may not give as good an explanation of SME financing behaviour as previously thought, it does indicate that the business cycle has a significant impact on the financing behaviour of SMEs. The results of the study show a falling level of support for the Pecking Order over the observed time period, however this rejection of the Pecking Order is not in favour of the Trade-off model. It shows that there is a downward sloping trend for the Pecking Order coefficients for English and Scottish SMEs in particular over the

sample period with inconclusive results on the coefficients for the Irish sample. This downward trend in the Pecking Order coefficients may be due to the availability of alternative financing sources to English and Scottish SMEs over the period. The research further highlights the increased investment across the regions and the subsequent decline over the sample period consistent with what you would expect from trade cycle and subsequent crisis. While recent official research points to a decline in bank lending to SMEs (BIS, 2012; Central Bank of Ireland, 2012) for both demand and supply reasons, this research indicates that alternative sources of finance such as internal financing and various forms of trade credit have increased in importance over the crisis period. In addition, while the research finds support for many of the empirical predictions of the Pecking Order, it is my belief that the role of non-formal sources of bank finance raise questions about the role of the Pecking Order as the primary theory of SME capital structure. This is further reflected by the insignificant role of the role financing deficit squared variable in the analysis, which is there to capture debt capacity.

This paper does not support the proposition that the Pecking Order is an excellent first order descriptor of SME financing decisions unlike prior studies (Chittenden et al., 1996; Jordan et al., 1998; Berggren et al., 2000; Watson and Wilson, 2002; Mac an Bhaird and Lucey, 2010), in fact the empirical findings here suggest the opposite. The research does however, confirm the hypothesis that older, more established SMEs with greater level of assets, suffer less from debt capacity constraints further reflected by the squared financing deficit variable having little effect and often no effect on the observed Pecking Order coefficients in my sample.

As regards short and long-term debt finance, the analysis for the sample shows a downward trend in short term debt finance as a proportion of SME capital structure and an upward trend in the level of long-term debt financing over the positive economic growth years of the sample.

Finally, it is clear from a finance perspective; that both demand and supply side effects are taking place in this study. The combination of credit tightening and reduced economic confidence are apparent in the reduction in the level of investment in SMEs over the crisis. From a demand side, SMEs wish to source finance at an affordable rate. It may be the case that alternative sources of finance such as trade credit have become more important to SMEs, especially over the sample period of this study.

Chapter 3: Bank credit and Trade credit: Evidence from SMEs over the financial crisis[18]

3.1 Introduction

Since the onset of the financial crisis in 2008, bank lending to micro, small and medium sized enterprises (SMEs) has declined significantly in most developed economies. Recent figures for the EU show that new bank lending to SMEs (lending of <€1m) has declined by 47 percent since 2008, 21 percent in Italy, 66 percent in Spain and 82 percent in Ireland[19]. This is a major policy concern as lack of access to finance inhibits investment and economic recovery. The financial crisis not only effects the supply of money to firms for investment proposes, it also has knock on effects on the day to day operations of firms as they seek alternative sources of funds to finance their activities when overdraft facilities are reduced or withdrawn. The demand for alternative sources of funding, including business and personal credit cards rises (CBR, 2009) and the supply and demand for trade credit in the economy is also affected. The impact of the financial crisis depends on how financially exposed firms are at the time of the crisis. While some firms have cash at hand to cover shortages due to the reduction in bank facilities, others seek to manage their working capital more efficiently by delaying payments to suppliers and restricting credit provided to customers. Some firms make arrangements with state agencies to delay taxation payments. In some cases extra credit is negotiated, in others it is taken without agreement, as both suppliers and buyers adjust to the new conditions. In an

[18] This study was published in the International Small Business Journal. See: McGuinness, G. and Hogan, T. (2014). Bank credit and Trade credit: Evidence from SMEs over the financial crisis. *International Small Business Journal*, doi: 10.1177/0266242614558314.

[19] ECB Euro area bank lending survey. Available from http: www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html [Accessed on 1 Dec 2012]

adverse lending environment, it is likely that trade credit takes on an augmented role in financing economic activity, particularly in the SME sector. With the notable exception (see Carbó-Valverde, Rodriquez-Fernandez and Udell, 2012; Vermoesen, Deloof and Lavern, 2013) the majority of studies that examine trade credit and the financial crisis are based on listed firms from emerging market economies (Coulibaly, Sapriza and Zlate; Bastos and Pindado, 2013; Love, Preve and Sarria-Allende, 2007) and not on unlisted SMEs which is the focus of this study. This is an important research agenda, since SMEs are (a) more dependent on trade credit to cover their short-term financing needs (Berger and Udell, 1998; Petersen and Rajan, 1997), (b) have less potential to access external financing sources than larger firms (Berger and Udell, 1998; Cowling, Liu and Ledger, 2012; Rodriguez-Rodriguez, 2006), and (c) are more likely to be adversely affected by financing constraints (Beck, Demirgüç-Kunt and Maksimovic, 2008; Bernanke, 1983; Stiglitz and Weiss, 1981) and banking market concentration and the level of financial development (Agostino, Gagliardi and Trivieri, 2012; Ge and Qiu, 2007).

This chapter addresses a number of important questions within the current debate in the trade credit literature and within the context of SMEs. First, what is the role of trade credit in periods of financial crisis? Is there a redistribution of credit from financially stronger firms through trade credit finance to firms that are financially constrained in accessing bank finance? Second, does trade credit act as a substitute for bank credit in a credit constrained economy and are there sectoral differences associated with any substitution effect? The study contributes to evidence on redistribution and substitution effects by testing the case for unlisted SMEs during this recent pre-crisis and crisis/post crisis periods

and uses data obtained from the Amadeus database which contains up to 10 years of financial statement data on Irish companies. The data contains relevant profit and loss and balance sheet information on the same companies over a period of time conducive to doing panel data regressions with fixed effects. This study is the first to our knowledge that applies panel data analysis using the Amadeus data over the financial crisis.

Ireland provides a useful setting for this analysis, as SMEs in Ireland account for approximately 98% of all enterprises and 68% of all private sector employment (CSO 2011). Following the financial crisis and subsequent recession, Irish SMEs experienced both a dramatic reduction in bank lending and change in aggregate demand, with GDP falling for three consecutive years from 2008 to 2010. Over the period 2008- 2012, the Irish banking market became significantly more concentrated as measured by the share of assets held by the 5 largest banks. Similar banking sector concentration was evident in other European countries such as Cyprus, Greece, Ireland where banking sector restructuring took place (ECB, 2013). During the period 2003-2007, bank loans to property related businesses grew by unprecedented levels from €45 billion in 2003 to a peak of €125 billion in Q1 2008 (Whelan, 2013). Ireland's banking sector model also changed dramatically from one based on traditional deposit based lending to one that was highly dependent upon raising funds from short-term borrowing on international inter-bank and money markets. During the same period, international borrowings of the six main banks in the country rose from €15 billion in 2003 to over €100 billion in 2007, representing over half of the country's GDP (Whelan, 2013). This type of funding ultimately proved to be less stable than traditional deposit based lending. While Ireland was very

much exposed to a potential crisis, it was not the only European country where banking deposits were insufficient to satisfy the growth in domestic credit expansion. In the European 30 countries, the average ratio of bank deposits to GDP grew from 57 percent in 1999 to 89 percent in 2007, whereas the average ratio of private credit to GDP grew much more quickly from 67 percent in 1999 to 107 percent in 2007 (Lane and McQuade, 2013). In the immediate aftermath of the recession in 2008, the Irish government began a period of severe austerity measures coinciding with the troika bailout and the introduction of a banking guarantee. However, despite these measures and the guarantee to bank deposits, international investors continued to withdraw their funding. Research has found that, in particular, deposits of non-residents at the Irish banks covered by the guarantee declined from €162 billion in August 2010 to €116 billion by November 2010. Not surprisingly, coinciding with the reduction in official bank funding itself, there was an overall reduction in financial institutional lines of credit to SMEs too was also quite substantial. Figures shows that the outstanding stock of credit to non-financial, non-property related private sector fell by over 30 per cent from its peak in Q4 2008 to mid 2011 (Central Bank of Ireland 2012).

While the findings of this study show that net trade credit has declined over the crisis period indicating an overall reduction in inter firm financing in the aftermath of the financial crisis. The results provide evidence of a substitution of bank finance for trade credit when firms are constrained in accessing bank credit consistent with Carbó-Valverde et al. (2012), Fishman and Love (2003) and Petersen and Rajan (1997). The findings demonstrate a financial 'adjustment process' whereby financially vulnerable SMEs adapt to the

restriction in lending in the immediate aftermath of the crisis, by substituting bank finance for trade credit which is most likely extended by financially stronger SMEs. The panel analysis also indicates that the financial position of SMEs is a more important determinant of who redistributes credit within the sector than firm age or size.

The chapter is structured as follows. Section 2 provides a review of the literature on trade credit financing during times of credit restriction, focusing on the theories and evidence relevant to the hypotheses tested in this paper. Section 3 discusses the data and methodology applied in this research, while Section 4 discusses the findings of the paper. Section 5 outlines the limitations of the research and avenues for further research, while Section 6 concludes.

3.2 Literature review and hypotheses development

Trade credit use in SME finance and in periods of credit restriction

The importance of trade credit in financing economic activity has been noted in numerous studies. Ng et al. (1999) find that the amount of trade credit exceeds the primary money stock M1 by a factor of 1.5 in the U.S. In general, the terms of trade credit contracts differ for firms depending on a number of factors including the industry setting and the length of time in which they have been doing business together (Fishman and Love, 2003). This is important, particularly for SMEs that rely so heavily on internal funds and on bank lending, especially bank overdrafts as a means of short-term financing. While trade credit is generally thought of as a short term method of financing (Nilsen, 2002), it plays a very important role in the everyday organisation and decision making of firms too (Rodriquez-Rodriquez, 2006).

Theory on trade credit is not new. Its role has been examined from a number of different perspectives including, transactions costs, redistribution, substitution, market power and relationship lending. One of the key benefits to suppliers in extending trade credit is the knowledge they have regarding the credit worthiness of the firms they do business with. This is a result of the ongoing monitoring of orders, repayment schedules and the ability to enforce repayment or cut off future supplies (Love and Zaidi, 2010). Obtaining favourable trade credit terms also allows firms to reduce their overall borrowing costs, especially by obtaining discounts for early payment (Aktas, Bodt and Lobez, 2012; Fabbri and Klapper, 2009; Giannetti, Burkart and Ellingsen, 2011). Trade credit has also been shown to sustain the sales and profitability of SMEs prior to the financial crisis (Banos-Caballero, García-Teruel and Martínez-Solano, 2012). Trade credit can be a very expensive form of finance too, especially when firms do not avail of the early discount facility (Nilsen, 2002; Petersen and Rajan 1997), therefore, it may be beneficial for firms to hold cash as a precaution to avoid postponing and incurring the costs of late payment for goods (Wu et al., 2011).

This study examines the role of trade credit in the European context of Irish SMEs and extends the analysis to the post crisis period of 2008. The theoretical bases for this study are the redistribution view of trade credit financing and the substitution effect. The financing of firms during times of credit shortages has received increased attention in recent times (Drakos, 2013; Love and Zaida, 2010; Vermoesen et al., 2013) in particular, the role of trade credit and whether it can act as a substitute for official lines of credit in times in financial tightening has returned to the forefront of finance research (Huang, Shi and

Zhang, 2010; Love et al., 2007; Love and Zaida, 2010 among others). Redistribution theory developed by Meltzer (1960) suggests that large liquid firms are net suppliers of credit to smaller firms because they have better access to bank finance. Empirical evidence of this theory has been shown in periods of tight money (Calomiris, Himmelberg and Wachtel, 1995; Nilsen, 2002). Calomiris et al. (1995) showed that large firms use commercial paper to fund trade credit during periods of monetary tightening. It is therefore predicted that the redistribution of credit from liquid firms can provide a cushion during a credit crunch for less financially liquid firms (Bias and Gollier 1997; Berger and Udell, 1998; Guariglia and Mateut, 2006; Kohler et al., 2000; Nilsen, 2002; among others), whilst also reinforcing supplier customer relations (Cunat, 2007). Evidence on redistribution during periods of financial crises is mixed, as banking systems are not properly functioning as in 'normal' times (Boissay and Gropp, 2007; Love et al., 2007). Love et al. (2007) find empirical evidence of the redistribution effect for a sample of large listed firms in emerging markets; however they find that this effect shuts down during a financial crisis. Consequently, firms become unable to redistribute credit to less privileged firms after a period of time. Choi and Kim (2005) and Marotta (1997) both find empirical evidence against the redistribution view. Choi and Kim (2005) state that when banks refrain from lending to smaller firms during a monetary contraction, large US firms often refrain from extending financial help to small firms too. They find that trade credit increases at the time of a crisis and then declines significantly in the period straight after. They find little evidence that the increase is proportionately more for small than for large firms. Marotta (1997) finds that small financially constrained firms are not shielded from

monetary tightening through the redistribution mechanism as proposed by Meltzer (1960).

Similarly, there is mixed evidence as to whether trade credit financing can be used as a substitute for bank finance. Theoretical support for the substitution effect can be found in some studies (Bias and Gollier, 1997; Burkart and Ellingson, 2004; Cunat, 2007; Meltzer, 1960 and Wilner, 2000) and empirically using cross sectional US data (Danielson and Scott, 2004; Fishman and Love, 2003 and Petersen and Rajan, 1997). Other studies find support contrary to the substitution effect during banking crises. These studies show evidence that small illiquid firms pass on liquidity shocks to their suppliers along the supply chain, thus propagating reduced trade credit and ultimately default in many cases (Boissay and Gropp, 2007; Kiyotaki and Moore, 1997 and Love and Zaida, 2010). Furthermore, the possible substitution between trade credit and bank credit is likely to be determined by the country setting firms operate in (Demirguc-Kunt and Maksimovic, 2001; Hernández-Cánovas and Koeter-Kant, 2011). Huang et al. (2010) provide evidence of a substitution effect between trade credit and bank credit and a counter cyclical relationship between trade credit and GDP using a panel dataset of 284 large publicly listed Chinese companies over the period 1998-2006. Love et al. (2007) and Love and Zaida (2010) examine the role of trade credit during the financial crises in emerging economies of Thailand, Philippines, Indonesia and Korea in the late 1990's and find evidence against the premise that trade credit can act as a substitute to bank credit during financial crises. Instead, they argue that liquidity shocks are passed along the supply chain exacerbating the financial shocks from the reductions in credit from financial lines.

The majority of trade credit studies are based on large US listed firms (Calomiris et al., 1995; Choi and Kim, 2005; Garcia-Appendini and Montoriol-Garrig, 2013 among others) or publicly listed firms from emerging market economies (Coulibaly et al., 2013; Love et al., 2007 and Love and Zaida, 2010). This may reflect the lack of comprehensive data on SMEs and their financing. In a recent study, Garcia-Appendini and Montoriol-Garrig (2013) find that large US firms extended credit to financially weaker large firms throughout the crisis. Despite these findings, there is little evidence regarding the role of trade credit financing for small and medium sized firms and whether it has acted as substitute to bank financing over the recent crisis, particularly in the case of unlisted SMEs which are the focus of this study. The nearest study to examine the role of trade credit to SMEs is Carbó-Valverde et al. (2012). They examine the role of trade credit for a sample of Spanish SMEs over the period of 2004 to the onset of the financial crisis in 2008. They find that financially constrained SMEs depend on trade credit to finance capital expenditures at the onset of the crisis. The findings of their study implies a significant role for credit and investment amongst SMEs by modelling those of which are constrained in their access to bank finance. My studies differs from Carbó-Valverde et al. (2012) by examining the effective role of trade credit in financing SMEs over the period of the financial crisis and beyond, focusing on the role of trade credit as a substitute for bank finance for financially constrained SMEs.

Given that my sample is made up of unlisted SMEs, we expect the dramatic reduction of bank credit extended in Ireland, as a result of the financial crisis, to have a significant impact on the level of trade credit extended within the SME

sector. Therefore, the first hypothesis we test is for the overall reduction in trade credit after the crisis.

3.2.1Trade credit hypotheses

H1: Overall trade credit reduces over the financial crisis.

Overall, the expectation is that net credit redistributed by financially stronger firms rises immediately after the crisis and falls thereafter, such that the impact of the crisis would be seen in year one of the crisis and fall in subsequent years. Bernanke (1983) argued that the disruptions in the banking sector following the Great Depression reduced the efficiency of credit allocation and consequently aggregate demand and output. Thus the secondary effects of increased lending restrictions and credit availability to firms in the years after the onset of the crisis is likely to reduce the overall supply of credit and allocation of credit in the economy reducing the level of trade credit extended and received.

H2.**A**: Financially liquid firms extend more trade credit following the financial crisis.

H2.B: Financially illiquid firms receive more trade credit following the financial crisis.

According to the redistribution view of trade credit, financially stronger firms have the ability to pass on credit to financially constrained and vulnerable firms via their accounts receivable. Trade credit in this way acts as important source of financing when credit from financial institutions is not available. This leads to the third hypothesis.

H3: Trade credit acts as a substitute for bank finance for SMEs in a financial crisis.

Do firms that would normally access bank credit switch to trade credit in a financial crisis? If trade credit acts as a substitute for bank finance for credit constrained or financially illiquid firms that would have received bank financing prior to the crisis, then trade credit received use increase for this group of firms in the period after the financial crisis of 2008. This leads to hypothesis number 4.

H4: Trade credit received will be strongest for the period straight after financial crisis, particularly in terms of quantity and length of credit time.

Next to assess the role of collateral and use of trade credit finance. Specifically, we assess if there is a relation between the level of intangible assets in firms' balance sheets and the likelihood of receiving trade credit financing. This is particularly important for innovative firms or firms that invest more in research and development. It is likely that this group of firms are most likely to be adversely affected by the banking crisis, where capital requirements by banks restrict the allocation of official credit to innovative SMEs in particular.

H5: Innovative firms will depend more on trade credit finance in the crisis period as opposed to pre-crisis years.

Petersen and Rajan (1997) show that firm age has a non-linear effect in terms of financing. Reputation and credit worthiness are much more important in the early years of a firm's life and these factors take time for firms to acquire. To account for this non-linear effect of age, the square of the age variable is included alongside the age variable itself. Alternative variables such as retained profits and the size of firm assets are likely to capture the effect of SME age on the level of trade credit granted. Firm assets are also a good indicator for collateral, which has previously been found to be a good in alleviating the

problems of information asymmetries and securing debt finance for SMEs (Mac an Bhaird and Lucey, 2010).

H6: Older SMEs are more likely to extend trade credit than young SMEs.

3.3 Data, variables and methodology

The data consists of Irish SME financial statement data obtained from the Amadeus database supplied by Bureau Van Dijk. The Amadeus data is derived from accounts filed at the official Irish government's Companies Registration Office (CRO). In total there were 158,666 private limited companies registered in Ireland in 2012 (CRO, 2013) representing 79.3 percent of the estimated 200,000 total number enterprises in the economy (Eurostat, 2013, The Structural Business Statistics Database). The sample obtained in this paper includes over 7,600 SMEs with balance sheet and profit and loss account information over the period 2003-2011[20]. While the sample only represents a small proportion of the total number of limited companies registered in Ireland, it is important to note that it is much more representative of surviving companies as the sample size is quite significant for two reasons: (1) The figure of 158,666 companies masks the fact that each year an average of 9.1 percent of the total are new entrants and 8.9 percent are exits. The sample population is also significantly impacted by the provisions of the Companies (Amendment) Act 1986[21], whereby many

[20] Regression analysis is applied up to year 2011 as the level of responses reduces dramatically in year 2012 due to data not fully available when we began our data analysis. Therefore we focus on years 2003-2011 in our analysis. The data is strongly balanced for years 2003-2011.

[21] Small sized companies are exempted from the full extent of the requirements relating to annual accounts in respect of the company satisfies two of the three following conditions: Balance sheet total not exceeding €4.4m, Turnover not exceeding €8.8m, Employees not exceeding 50. Companies under Section 8 (Amendment) Act 1986, as amended by Regulation 4

SMEs in Ireland are exempt from filing complete financial accounts. Thus of the 15,964 companies in the sample with employee data of at least 2 employees and less than 250 employees, only 7600 have financial data for at least two/ three of the years of sample period (2003-2011).

SMEs are defined according to the standard European Commission (2005) criteria[22], which includes firms that employ less than 249 workers in a given year and have either an annual turnover of less than €50m or a balance sheet total of less than €43m. Micro enterprises are also included in the sample. In this study, we scale by the number of employees and the balance sheet totals of each SME in each year. The criteria for the sample are as follows:

- All active firms employing less than 249 employees in each of the sample years.
- All firms with balance sheet total of greater than €43,000,000 or annual turnover greater than €50,000,000 in any of three consecutive years of the sample years are excluded.
- Firms that are reported to be listed or delisted are excluded.
- The analysis excludes all financial and insurance companies, in line with existing empirical studies.
- Public utilities such as public transport and postal services are also excluded from the sample.
- All financial variables are winsorised at the 1% and 99% level[23].

European Communities (Accounts) Regulations 1993 and European Union (Accounts) Regulations 2012).

[22] The European Commission provide a comparable reference group for defining SMEs across the European Union. See http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/

[23] This is to mitigate the effect of extreme outliers in the data. The data excludes subsidiary firms.

- All responses for creditor/debtor days, accounts receivables and accounts payables are greater than zero in any given year.

These restrictions reduce the initial sample by a further 325. In total, the final sample contains approximately 7618 Irish SMEs and 68,562 firm year observations over the period 2003-2011, all of which remain active over the sample period. Based on sales turnover of the last three years of the sample and scaling turnover according to European Commission (2005), the panel contains approximately 6002 micro enterprises (78 percent of total sample[24]), 864 small enterprises (11.5 percent of total sample), and 723 medium sized enterprises or (9.5 percent of the total sample). Firms employing 10 persons or fewer in a given year are classified as micro enterprises, while those that employ between 10 and 49 workers are labelled small, and finally, enterprises employing between 50 and 249 employees are classified as medium sized enterprises.

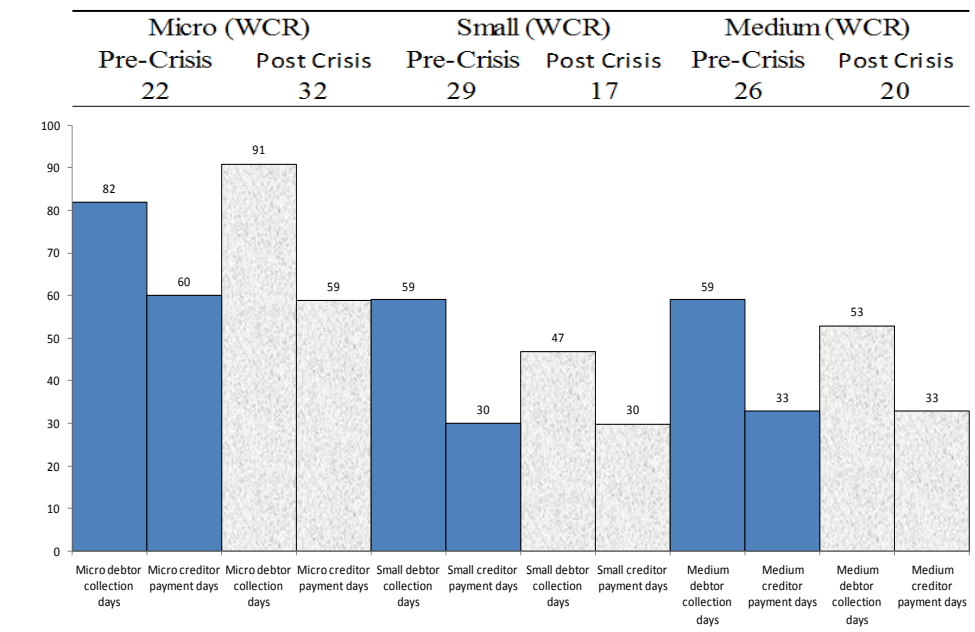
Figure 3.1 shows the changes in the number of debtor and creditor collection days and the efficiency in working capital in micro and small enterprises over the sample period. As can be seen from Figure 3.1, average micro debtor collection days have slightly increased from 82 pre-crisis to 91 during the crisis, while payment days have reduced from an average of 60 days to 59 for micro enterprises meaning an increase in the Working Capital Requirement (WCR) from 22 days pre-crisis to 32 in the crisis. Small enterprise debtor collection days have reduced from an average of 59 days prior to the crisis to 47 days during the crisis, while small firm payments days have remained the same[25]. In addition the median numbers of days over the two periods are also presented. As

[24] Of our sample of micro enterprises, approximately 1700 employ less than 5 employees annually.

[25] All figures are winsorised at the 1 and 99 percentile range to mitigate the effects of extreme outliers which influence sample means.

we can see from the figures presented above, the change in micro debtor collection days appears quite significant; however the median figures show micro debtor days to have risen only from 43 to 45 days over the two periods, suggesting the figures are skewed to the right as we would expect. This is a strong indication that the "bad" debtor days or the very long length of days have gotten worse over the two periods for some firms, hence pushing the average figure up. Even basing this change in WCR on the median figures, this represents an increase in WCR days from 16 to 20 days for micro enterprise where WCR has reduced for both small and median enterprises based on either mean or median figure. The change of 9 days in the mean debtor days for micro enterprises also represents an approximate move of 6 standard deviations of the mean of the micro sample, therefore indicating that the average has over the two periods has moved.

Figure 3.1 The average (mean) number of debtor and creditor days and the working capital requirement (WCR) of SMEs measured in days



Median	43	27	45	25	51	16	33	17	56	26	49	28
St.Dev	102	84	115	90	56	45	52	46	42	29	42	29
s/√n	1.3553	0.1088	1.51	1.165	1.92	1.548	1.8425	1.657	1.578	1.1276	1.5902	1.111

The 'Pre-crisis represents the average values over the period 2003-2007 and the 'Post Crisis' represents the average values from 2008-2011. (WCR) in days is measured as the difference between debtor days minus creditor days in both periods.
Sample size: 7618; micro represent 78% of sample, small (11.5%), medium(9.5%)
S/√n represents the standard deviation of the sample mean

From Figure 1, a steep reduction in small firm debtor collection days over the two periods from 59 to 47 is observed. In this case the median change is actually from 51 to 33. This too represents an interesting change over the two periods. This reduction of 12 average debtor collection days also represents an approximate movement of 6 standard deviations of the mean of the small firm sample. These changes are a strong indication that the differences we observe over the two periods are not by chance. Average Medium sized enterprise collection days (while still high) have reduced from an average of 59 pre-crisis to 53 in the crisis/ post crisis period. In terms of working capital requirement, micro enterprises have been placed under the most pressure in terms of receiving their payments from suppliers over the two periods. These figures

would suggest greater changes in terms of efficiency in working capital appears to be taking place in small firms over the crisis period, where micro firms appear to be experiencing a deterioration in WCR days in comparison to small and medium sized firms.

When examining debtor and creditor days across industries, it can be seen that the average level of trade credit received has increased for food processing, wholesale and business services sectors. Trade credit levels decrease for real estate and community services/ residential care services. There are changes within the two periods; debtor days generally reducing in all sectors with the exception of construction and retail (see Table 3.1)[26]. The largest proportion of SMEs in the sample are in the sectors of real estate services, hospitality and tourism and community services, with the lowest proportion in construction, retail and publishing (see Table 3.3). The figures suggest that cash in some sectors is being collected more quickly since the onset of the crisis; however some sectors have seen an increase in the levels of trade credit financing received over the crisis period. These include food processing, wholesale and business services (Table 3.2). As pointed out by Love et al. (2007) the redistribution of credit from financially stronger to financially weaker firms during a banking crisis is based on the assumption that firms with better access to external finance will redistribute credit via trade credit to financially weaker firms. In the event of a credit crunch as experienced in the Irish context where bank lending effectively stopped, redistribution requires a transfer of credit from cash rich firms to those firms that are constrained in access bank finance.

[26] See Tables 3.1.1 and 3.1.2 Appendix for overall levels of net credit calculated as calculated as trade receivables minus payables divided by the total sales of the firm in each year.

Table 3.1 : Average debtor and creditor collection days across industry sectors for SMEs in Ireland 2003-2011

Average Debtor days across	All	Food/ manufacturing	Construction	Wholesale	Retail	Hosp and Rec	Broadcasting / publishing	Business services	Community work
Pre-Crisis	**45**	**58**	**47**	**75**	**16**	**25**	**60**	**61**	**21**
Std. Dev	(78)	(64)	(84)	(55)	(54)	(76)	(46)	(82)	(65)
Skewness	2.28	2.37	2.2	2.23	2.81	3.18	0.94	2.36	3.93
Crisis	**45**	**51**	**49**	**65**	**17**	**23**	**51**	**55**	**17**
Std. Dev	(110)	(62)	(75)	(75)	(56)	(51)	(68)	(83)	(68)
Skewness	2.19	3.21	2.62	2.89	4.56	3.24	3.23	2.44	4.44
Average Creditor days across sectors									
Pre-Crisis	**26**	**27**	**33**	**25**	**37**	**24**	**28**	**19**	**15**
Std. Dev	(80)	(51)	(60)	(42)	(50)	(65)	(88)	(76)	(71)
Skewness	2.90	4.49	2.47	3.33	2.79	3.36	2.86	2.97	3.67
Crisis	**25**	**32**	**39**	**29**	**34**	**23**	**29**	**24**	**12**
Std. Dev	(84)	(74)	(93)	(66)	(52)	(75)	(71)	(99)	(72)
Skewness	2.99	3.84	2.75	3.89	4.09	3.2	3.26	2.71	3.89

*The Pre-crisis represents the average values over the period 2003-2007 and Crisis represents the average values from 2008-2012.
ST.Dev are shown in parenthesis
The figures represented illustrate the average number of days calculated using the median.

Table 3.2 : Average (mean) levels of trade credit by sector

Industry sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average	β
Food processing/manufacturing	0.08	0.1	0.08	0.11	0.13	0.14	0.18	0.19	0.2	0.13	.0163***
Construction	0.11	0.14	0.11	0.21	0.18	0.15	0.26	0.31	0.25	0.19	.021***
Real estate	0.28	0.27	0.31	0.28	0.28	0.25	0.24	0.24	0.24	0.27	-.007**
Wholesale	0.11	0.11	0.13	0.15	0.17	0.17	0.17	0.17	0.16	0.15	.008***
Retail trade	0.19	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	-.002
Hospitality and Tourism	0.15	0.11	0.18	0.16	0.15	0.15	0.17	0.15	0.15	0.15	.001
Business services	0.19	0.15	0.21	0.2	0.18	0.2	0.2	0.21	0.25	0.20	.006*
Community services	0.16	0.14	0.15	0.14	0.13	0.13	0.13	0.11	0.1	0.13	-.006***
Average across years	0.16	0.14	0.16	0.17	0.17	0.17	0.19	0.19	0.19	0.17	

* Trade credit recieved is calculated as trade payables divided by the total sales of the firm in each year
* β is the estimated coefficient the regresssion $TC = \alpha + \beta_1(year) + \varepsilon_1$, indicating how much trade credit increases for each sector for each year of the sample from a simple pooled regression with no control varaibles. Positive values of β indicate an increase in average levels of trade credit recieved in a given sector over the sample period. ***, **, * represent statistical significance at the 1%,5% and 10%

Table 3.3 Summary statistics for the final year of the sample 2011

Industry sectors	No. of SMEs	Sample (%)	Emp		Firm age		Sales		Cashta	
Food processing/ manufacturing	261	3.3	51	(51)	24	(13)	9200000	(1000,000)	0.32	(.03)
Construction, real estate and related activities	204	2.6	14	(22)	16	(8)	2,100,000	(5200,000)	0.37	(.34)
Wholesale	346	4.4	25	(31)	22	(12)	7,800,000	(9,400,000)	.27	(.26)
Retail trade	224	2.8	42	(51)	21	(10)	7,500,000	(9,500,000)	0.3	(0.3)
Hospitality, tourism and recreation	1230	15.5	12	(21)	20	(10)	780,000	(2,900,000)	0.7	(.33)
Broadcasting, publishing	70	0.1	27	(45)	15	(7)	4,300,000	(7,800,000)	0.38	(.33)
Business services	603	7.6	14	(24)	17	(7)	2,000,000	(5,200,000)	0.49	(.34)
Community work activities, residential care	2281	28.7	16	(24)	17	(8)	500,000	(1,700,000)	.80	(.27)

Figures represent mean levels of employment, firm age, sales and cash at bank and in hand of company scaled by firm assets(Cashta)
Note: Figures in paranthesis denote Standard Deviation

3.4 Multivariate analysis

Debtor and creditor days are one measure of the use of trade credit amongst SMEs; they indicate the length of time for payment of goods to take place. To avoid potential biases or misleading inferences from the results, it is necessary to use several methods of estimating trade credit use. Most noticeably, it is important to take account of differences amongst SMEs in terms of their financial vulnerability to the crisis. Similar to Love et al. (2007), we examine the use of trade credit prior to the period of financial crisis and during the financial crisis using panel data. As outlined in Chapter 1, the advantages of panel data are significant including the study of changes in trade credit financing over a period of time and ultimately, by giving the researcher more information, more variability, more degrees of freedom and efficient estimates (Baltagi, 2008). Most importantly, in terms of the estimates, panel data allows for the control of unobservable and individual heterogeneity. Variables are scaled for trade credit by firm sales for account receivables and payables in Tables (3.5), (3.6), (3.10) and by firm assets in Table 3.8 and Table 3.9[27]. In Tables (3.7) and (3.10), the length of credit days are estimated using the natural logarithm of creditor and debtor days and by the difference between debtor and creditor days for each firm, in total, the analysis includes nine different measures of trade credit including the three measures of creditor and debtor days.

[27] In Tables (3.8) and (3.9), Trade credit values are scaled by firm assets due to fewer data availability for asset intangibility and cash flow.

Table 3.4 Descriptive statistics for the major variables of the study

	2003-2007						2008-2011					
Variables	**Obs**	**Mean**	**ST.Dev**	**0.25**	**Median**	**0.75**	**Obs**	**Mean**	**ST.Dev**	**0.25**	**Median**	**0.75**
Firm age **AGE**	38090	13.2	51	5	9	15	38090	17	51	4	14	20
Total assets	38090	710000	2200000	13036.00	43636	200000	31432	920000	2400000	18014	60023	260000
Number of employees **EMP**	5096	19	32	3	7	20	15203	17	29	3	6	18
Creditor payment days **Creditordays**	8194	53	76	10	26	62	14224	53	79	9	26	61
Debtor collection days ***Debtordays***	8982	78	95	17	45	97	15965	85	110	16	45	104
Debtor days minus creditor days **Numdays**	5724	21	85	-12	11	52	10630	30	97	-10	13	56
Accounts recievable/ firm assets **Tradedebtorsassets**	11518	0.39	.31	0.11	0.33	0.63	18632	.37	.31	0.09	0.29	0.6
Accounts payable/firm assets **Tradecreditorassets**	12447	0.45	.76	0.06	0.2	0.51	17553	.44	.81	0.05	0.16	0.46
Accounts recievable minus payables/ firm assets **Netcredita**	11518	-0.01	.68	-0.13	0.03	0.31	17553	-.02	.70	-0.09	0.04	0.29
Total firms short term debt/ firm assets **Loansta**	36520	0.52	2.61	0	0	0.08	30608	0.66	2.94	0	0	.16
Accounts payable/ sales **Tradecreditorst**	8536	0.19	0.37	0.02	0.07	0.17	15209	0.19	0.37	0.02	0.08	0.17
Accounts recievable/ sales **Tradedebtors**	8375	0.26	0.43	0.04	0.12	0.28	16499	0.28	0.44	0.04	0.12	0.31
Accounts recievable minus payables/ sales **Netcredit**	8375	0.05	0.36	0	0	0.06	15209	0.09	0.44	-0.03	0.02	0.15
Credit extended by banks as % of GDP **PcreditGDP**	38090	156	29.0	133	159	179	30472	222.00	9.55	215	225	229
Gross domestic product per capita growth **GDPpcg**	38090	2.9	0.54				38090	-2.20	2.69			
inter money market lending rate **irmoneymkt**	38090	2.99	1.03	2.13	2.4	3.64	30472	1.35	0.97	0.64	0.97	2.06
Cash and Cash equivalent/ firm assets **Cashta**	33809	0.61	0.35	0.27	0.69	0.96	28823	0.62	0.35	0.3	0.73	0.96
Cash of firm and deposits at bank/ firm assets **Cashflowta**	9187	0.39	1.51	0.02	0.17	0.45	15779	0.04	14.36	-0.02	0.1	0.35
Intangible to total assets **Intang**	23971	0.01	0.07	0	0	0.01	19990	0.01	0.07	0	0	0.01
Firm assets(year1) - Firm assets(year 0)/ Firm assets(year 0) **Invest**	18337	0.32	1.73	-0.13	0.01	0.13	18931	0.04	0.87	-0.2	-0.03	0
Net sales plus opperating revenues/ firm assets **Opprev**	21204	5.07	12.07	1.01	2.06	4.23	28440	4.73	11.26	0.84	1.82	4
Firms sales(year1) - firm sales (year 0)/ Firm sales(year 0) **Salesgrowth**	13370	1.83	29.000	-0.05	0.07	0.25	26865	0.05	0.55	-0.13	-0.01	0.09

The variables for credit received are: accounts payable scaled by firm sales (*tradecreditorst*), accounts payable scaled by firm assets (*Tradecreditorassets*) and the number of creditor collection days. The variables for credit extended are: accounts receivable scaled by firm sales (*tradedebtors)* accounts receivable scaled by firm assets (*Tradedebtorassets),* and the number of debtor collection day. Table 3.4 illustrates differences in mean levels of the variables for the two periods of the crisis and pre-crisis. Given that the sample period (2003-2011) covers a period of economic boom and recession, descriptive statistics are split into two separate periods (2003-2007) and (2008-2011). All the economic indicators such as firm sales growth, profits, GDP per capita growth and retained profits and credit extended by the banking sector to private enterprises (PcreditGDP) are different from pre-crisis to crisis periods. It is also worth noting that the sample as a whole is made up of mainly mature SMEs with an average age of 17 years. Therefore, this research is based on what might be termed "resilient firms" which survived over the seven year period in question.

To test the set of hypotheses outlined in this study, it is necessary to distinguish between the characteristics of the SMEs in my sample. I employ panel data fixed effects and control for the financial position or strength of SMEs entering the financial crisis period based on their financial vulnerability to the crisis, as measured by (A) the level of short-term debt financing, (B) the level of 'Cash' held by the SME prior to and during the crisis, (C) the level of intangible assets to total assets and (D) the level of cash flow of the firm. The Cash variable is a measure of cash stocks held by the company and deposited in banks. As a first measure, we examine the ratio of short-term debt to assets prior to the crisis. Reliance on short-term debt is used as a proxy for vulnerability to the crisis in several studies (Love et al. 2007; Guariglia and Mateut 2006). As per hypotheses 2A and 2B, firms with higher short term debt are expected to reduce their provision of credit as a result of the financial crisis and increase their use of trade credit financing, relatively more so than those with lower short-term debt ratios (Love et al. 2007) given the difficulty in obtaining financing from banks.

Basic regressions for trade credit take the form of the equation below, where t and i indicate the time period and individual SMEs, α is the firm fixed effect. X is a vector of firm specific control variables. To examine the responses of SMEs to crisis, I use the interactions of the financial position of the firm in the pre-crisis year (2007) with the crisis year (2008) and the post-crisis years (Postcrisis) where $FST_{i(-1)}$ represents the financial strength of SME (i) measured in the pre-crisis year and this value is fixed. Financial strength or position of the firms is measured using the four factors above in separate regressions. ε_{it} represents the error term which is comprised of unobserved time

invariant ($\cap_i$) and time variant (V_{it}) factors. Variants of this approach are applied.

Equation 6 Trade credit over the crisis

$$TC_{it} = \alpha_i + \beta_1^* crisis + \beta_2^* \text{Postcrisis} + \beta_3^* \text{FST}_{i(-1)} * crisis + \beta_4^* \text{FST}_{i(-1)} * \text{Postcrisis} + X_{it} + \varepsilon_{it},$$

$$\text{where } \varepsilon_{it} = \cap_i + V_{it}.$$

Causal factors that are time invariant, including industry effects which influence trade credit are captured by the fixed effects. All other explanatory variables change over time are predicted to be factors that influence the level of trade credit. These factors include age, growth in sales (salesgrowth), cash reserves (Cashta), size (log of total assets) the level of economic activity indicated by GDP per capita (Gdppcg). The first table shows the significance of an SME financial position and use/provision of trade credit. A Hausman test was also conducted and this showed in favour of the fixed effect regression over random effects.

3.5 Findings

In Table 3.5[28], trade credit use since the crisis is examined taking SMEs' financial stance into account by using both year dummies and interactive dummy variables to capture the relationship between financial position of SMEs entering the crisis and the their use of trade credit during and after the crisis. The analyses captures both the levels of credit received and extended by SMEs as well as a variable to capture the overall change in trade credit (Netcredit). To

[28] In Table 3.5, we scale trade credit by sales instead of total assets. Love et al. (1997) find a significant change over time in assets and sales. It is possible that firms in financial distress undergo assets sales, and often in times of financial distress drops in assets are far steeper than the drop in sales. Therefore to main consistency, trade credit is scaled by sales.

avoid any potential endogeneity/ simultaneity, all explanatory variables are lagged. Age is included as well as the values of age squared. Overall, the results indicate that firms with greater short-term debt to assts ratios entering crisis receive more credit (as measured by the interactive dummies in columns 1 and 1A), and extended less credit compared to pre-crisis levels (Columns 2 and 2A). While overall net credit extended by firms with greater short-term debt to assets ratios entering the crisis extended significantly less trade credit in the years 2008, 2009, 2010 and 2011, as indicated in column 3B. These findings support H2 B. The results are also statistically significant in both columns 1and 1A when we include additional firm specific control variables of age, size and sales growth. Consistently, we can also see that while the firms more 'vulnerable' to the crisis in terms of their reliance on short-term bank finance extend less trade credit to their customers over the same period. Older firms and higher growth firms appear to be net providers of credit and it is consistently shown within each regression format that older firms receive less trade credit financing from their suppliers supporting H6.

Table 3.5 Trade credit and short-term debt

The dependent variables are 'Tradecreditorst' calculated as accounts payable scaled by turnover, 'Tradedebtors calculated as accounts receivable scaled by turnover and 'Netcredit' as accounts receiveable minus payables scaled by turnover. Independent variables include 'Crisis' represents a year dummy variable for the year of financial crisis impact in Ireland(2008), while 'Post1', 'Post2' and 'Post3' are time dummy variables for the years 2009, 2010 and 2011 respectively.

Crisis*loansta-1 represents the SME level of short-term bank loans to assets ratio one year prior to the crisis year. The interactions with 'loansta-1' show the effects of 'loansta-1' during the crisis and the three years following the onset of the crisis. The models are estimated with fixed effects and include the independent variables of 'Size' represented by the natural logarithm of firm assets, a measure of sales growth 'salesgrowth' and the age of the firm (Age) and the squared age of the firm 'Age^2'.Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and 10% level.

	(1) Tradecreditorst	(1A) Tradecreditorst	(2A) Tradedebtors	(2B) Tradedebtors	(3A) Netcredit	(3B) Netcredit
Crisis	-.024***	-.009*	-.007	-.018***	.003	-.007
	(.00)	(.00)	(.00)	(.01)	(.00)	(.00)
Post1	-.011**	.003	.012**	-.010	.008	-.012
	(.00)	(.00)	(.00)	(.01)	(.00)	(.00)
Post2	-.012**	.010	.032***	.0001	.014**	-.015*
	(.00)	(.01)	(.00)	(.00)	(.00)	(.01)
Post3	-.102***	.011	.046***	.005	.035***	-.002
	(.00)	(.01)	(.00)	(.01)	(.00)	(.01)
Crisis*loansta-1	.005***	.006***	-.001	-.001	-.006***	-.007**
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 1*loansta-1	.007***	.009***	.007**	.009**	-.007***	-.004
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 2*loansta-1	.009***	.010***	.004	.007**	-.005*	-.005*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 3*loansta-1	.009***	.008***	.006**	.002	-.010***	-.009***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
lag Size		-.0002		-.001**		-.0001
		(.00)		(.00)		(.00)
lag salesgrowth		-.0001**		.001		.0001**
		(.00)		(.00)		(.00)
Age		-.004**		.011***		.009***
		(.00)		(.00)		(.00)
Age^2		-.0001		-.0001		-.003
		(.00)		(.00)		(.00)
Fixed Effects	YES	YES	YES	YES	YES	YES
Constant	.195***	.269***	.257***	.110**	.078***	-.057
	(.00)	(.00)	(.00)	(.04)	(.00)	(.04)
Observations	23502	16194	24651	17835	28067	22850
number of groups	5247	4336	5488	4642	6281	5824
obs per group(average)	4.5	3.7	4.5	3.8	4.4	3.9
Adjusted R-squared	.65	.72	.71	.75	.56	.60

* Industry sector dummies makes no difference to results as they are excluded automatically with fixed effects

In Table 3.6, I examine if firms with a better cash position prior to the crisis provide more trade finance to their customers during the crisis period. As expected, when we control for firm size, sales growth and firm age, firms with the greatest levels of cash and cash equivalent reserves, on entering the crisis, extended more trade credit finance and this result is shown to be statistically significant particularly for the variable capturing net credit extended and also supporting H2A. Overall, the results suggest an increase in reliance on trade credit financing amongst firms most financially vulnerable at the time of the

banking crisis, i.e. firms with the highest levels of short-term debt financing and lowest levels of cash reserves. These firms are more likely to receive trade credit financing after the onset of the financial crisis, due to the difficulty of rolling over short-term bank debt and overdrafts. The results suggest evidence of a substitution effect for firms most financially vulnerable at the time of the crisis supporting H3.

Table 3.6 Trade credit and cash

The dependent variables are 'Tradecreditorst' calculated as accounts payable scaled by turnover, 'Tradedebtors calculated as accounts receivable scaled by turnover and 'Netcredit' as accounts receiveable minus payables scaled by turnover . Independent variables include 'Crisis' represents a year dummy variable for the year of financial crisis impact in Ireland(2008), while 'Post1', 'Post2' and 'Post3' are time dummy variables for the years 2009, 2010 and 2011 respectively.

Cashta-1*Crisis represents the SME level of cash to assets ratio one year prior to the crisis year. The interactions with 'Cashta-1' show the effects of 'Cashta-1' during the crisis and the two years following the onset of the crisis. The models are estimated with fixed effects and include the independent variables of 'Size' represented by the natural logarithm of firm assets, a measure of sales growth 'salesgrowth', firm age and the age of the firm squared 'Age^2'.Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and 10% level.

	(1) Tradecreditorst	(1A) Tradecreditorst	(2A) Tradedebtors	(2B) Tradedebtors	(3A) Netcredit	(3B) Netcredit
Crisis	-.011	-.001	-.001	-.019**	-.019*	-.038***
	(.01)	(.01)	(.00)	(.01)	(.01)	(.00)
Post1	.004	.008	.015*	-.014	-.022**	-.044***
	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)
Post2	-.002	.015	.033***	-.007	-.025**	-.059***
	(.01)	(.00)	(.00)	(.00)	(.01)	(.00)
Post3	-.013	.004	.037**	-.017	.001	-.043**
	(.01)	(.01)	(.00)	(.00)	(.01)	(.01)
Crisis*Cashta-1	-.013	-.008	.0003	.007	.043**	.054***
	(.01)	(.01)	(.00)	(.00)	(.00)	(.00)
Post 1*Cashta-1	-.026**	-.009	.006	.012	.063***	.061***
	(.01)	(.00)	(.01)	(.00)	(.00)	(.01)
Post 2*Cashta-1	-.014	-.009	.009	.010	.078***	.076***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)
Post 3*Cashta-1	.006	.011	.033**	.035**	.062***	.060***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)
lag Size		-.001		-.0001		-.001
		(.00)		(.00)		(.00)
lag salesgrowth		-.002***		-.0001		.0001***
		(.00)		(.00)		(.00)
Age		-.004**		.013***		.012***
		(.00)		(.00)		(.00)
Age^2		-.001		-.0001		-.0001
		(.00)		(.00)		(.00)
Fixed Effects	YES	YES	YES	YES	YES	YES
Constant	.189***	.259***	.245***	.054	.069***	-.123**
	(.00)	(.00)	(.00)	(.04)	(.00)	(.00)
Observations	21953	15195	22637	16452	25939	21143
number of groups	4851	4051	5034	4283	5797	5383
obs per group(average)	4.5	3.8	4.5	3.8	4.6	3.9
Adjusted R-squared	.64	.71	.71	.75	.56	.60

* Industry sector dummies makes no difference to results as they are excluded automatically with fixed effects

For the other firm characteristics of size, sales growth and age, the results show that larger firms (as measured by the log of assets) extend more and receive less in the form of trade credit, supporting the proposition of Berger and Udell

(1998) that trade credit financing is more important in the financing of small firms. This result also supports the premise that larger older firms can access funds from institutions due to their larger supply of collateral, longer banking relationships and larger cash reserves too. The implementation of fixed effects isolates the specific individual effects of the crisis on the level of trade credit extended within the SME sector. There are a number of benefits of fixed effects in this scenario. It allows us to control for unobserved heterogeneous factors as well as time-invariant factors that influence the level of trade credit extended. With the inclusion of fixed effects, we can say with more reliability that firms with greater levels of cash extended more credit in the times of crisis, holding other unobservable and industry factors constant. As in Petersen and Rajan (1997) we use both the firm's age and size as a proxy for credit worthiness. Age of the firm shows how long it has survived and older firms are thought to be more credit worthy.

While Tables (3.5) and (3.6) estimate the relation between financially state of the firms and the level credit extended and received in terms of quantity. In Table 3.7, I estimate do the results hold for the length of time in which credit is extended and received.

Table 3.7 Financial strength and length of credit days

The dependent variables are 'logcreditordays' calculated as the natural logarithm of creditor days, 'logdebtordays' calculated as the natural logarithm of debtor days and 'lognumdays' calculated as the natural logarithm of the difference between debtor and creditor days. Independent variables include 'Crisis' represents a year dummy variable for the year of financial crisis impact in Ireland(2008), while 'Post1', 'Post2' and 'Post3' are time dummy variables for the years 2009, 2010 and 2011 respectively.

Cashta-1*Crisis represents the SME level of cash to assets ratio one year prior to the crisis year. The interactions with 'Cashta-1' show the effects of 'Cashta-1' during the crisis and the two years following the onset of the crisis. The models are estimated with fixed effects and include the independent variables of 'Size' represented by the naturaal logarithm of firm assets, a measure of sales growth 'salesgrowth' and the age of the firm 'Age^2'.Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and 10% level.

	(1) logcreditordays	(1A) Logcreditordays	(2A) Logdebtordays	(2B) Logdebtordays	(3A) Lognumdays	(3B) Lognumdays
Crisis	-.088***	.024	-.087***	-.162***	-.107***	-.155***
	(.03)	(.04)	(.02)	(.04)	(.04)	(.05)
Post1	-.079**	.054	-.066**	-.159***	.002	-.078
	(.03)	(.00)	(.00)	(.03)	(.04)	(.06)
Post2	-.085***	.056	-.089***	-.218***	.027	-.080
	(.00)	(.00)	(.03)	(.04)	(.04)	(.06)
Post3	-.156***	.003	-.088***	-.263***	-.031	-.166***
	(.00)	(.00)	(.03)	(.04)	(.04)	(.07)
Crisis*Cashta-1	-.046	-.119*	.100***	.126**	.213**	.191
	(.05)	(.06)	(.04)	(.06)	(.09)	(.11)
Post 1*Cashta-1	-.107**	-.154**	.171***	.198***	.198**	.178
	(.05)	(.00)	(.00)	(.05)	(.09)	(.07)
Post 2*Cashta-1	-.067	-.097	.340***	.364***	.275***	.204*
	(.05)	(.06)	(.04)	(.05)	(.09)	(.11)
Post 3*Cashta-1	.059	.037	.434***	.465***	.556***	.484***
	(.01)	(.06)	(.05)	(.05)	(.09)	(.11)
lag Size		-.0001**		-.0001		-.0001
		(.00)		(.00)		(.00)
lag salesgrowth		.0001		.0001		-.0001
		(.00)		(.00)		(.00)
Age		-.032***		.034***		.025***
		(.00)		(.00)		(.01)
Age^2		.00001		-.0001		-.001
		(.00)		(.00)		(.00)
Fixed Effects	YES	YES	YES	YES	YES	YES
Constant	3.19***	3.61***	3.56***	3.04***	3.47***	2.91***
	(.01)	(.00)	(.00)	(.00)	(.00)	(.35)
Observations	21072	14583	22727	15956	9334	6679
number of groups	4759	3956	4973	3.8	2809	2299
obs per group(average)	4.4	3.7	4.6	3.8	3.3	3.0
Adjusted R-squared	.64	.67	.72	.75	.65	.75

* Industry sector dummies makes no difference to results as they are excluded automatically with fixed effects

I examine the relationship between financial strength of the firm (measured by cash reserves) and the length of credit extended measured by the number of days in which they receive payment from their customers and the number of days in which they repay their creditors. Results are consistent with expectations that financially stronger firms receive less credit in terms of time and extend more over the crisis period. On average, firms with greater cash reserves extend between 12 and 46 percent longer time period to their customers to repay over

the crisis period (Column 2B), holding all other firm characteristics constant supporting H2A and H4. This could be derived from unwillingness from their customers to repay on time, or it could also be from a willingness on the part of financially stronger firms to allow flexibility in repayments to their financially constrained business partners.

The results for credit received show that financially stronger firms are receiving less time for their repayments (1A) in comparison to pre-crisis periods, however these results are not as statistically strong as for credit extension. Columns 3(A) and 3(B) also include a variable that captures net extension of credit measured in terms of time (lognumdays). This variable confirms the finding that financially stronger firms allowed a net extension of time for repayments greater than pre crisis periods. This variable is also statistically significant when we include additional control variables.

My final two measures of the financial position of SMEs are derived from the firms' ratio of intangible to total assets and the levels of cash flow. One of the benefits of asset tangibility, other than reducing asymmetric information, is that tangible assets can be used as collateral in times of bankruptcy and protecting creditor rights (Berger and Udell, 1998; Michael et al., 1999). We would expect firms with a higher ratio of intangible to total assets in their balance sheet are more likely to be financially constrained over the crisis due to their expected difficulty in accessing debt finance. I, therefore expect this group of firms to access trade credit over the crisis period, and where they do so to be in an involuntary basis given the reluctance of other firm (managers) to provide credit given the lack of collateral (stock) redeemable in the event of non-repayment.

Similarly, as in Love et al. (2007) I expect firms with greater liquidity measured by their cash flow to generate more trade credit to their customers.

Table 3.8 Trade credit and asset intangibility

The dependent variables are 'Tradecreditassets' calculated as accounts payable scaled by total assets, 'Tradedebtorsasets calculated as accounts receivable scaled by total assets and 'Netcredita' as accounts receiveable minus payables scaled by totalassets. Independent variables include 'Crisis' represents a year dummy variable for the year of financial crisis impact in Ireland(2008), while 'Post1', 'Post2' and 'Post3' are time dummy variables for the years 2009, 2010 and 2011 respectively.

Crisis*Constrained-1 represents the SME level intangible assets to total assets ratio one year prior to the crisis year. The interactions with 'Constrained-1' show the effects of 'loansta-1' during the crisis and the three years following the onset of the crisis. The models are estimated with fixed effects and include the independent variables of measure of sales growth 'salesgrowth' and the age of the firm and the squared age of the firm 'Age^{2}'.Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and 10% level.

	(1) Tradecreditassets	(1A) Tradecreditorassets	(2A) Tradedebtorassets	(2B) Tradedebtorassets	(3A) Netcredita	(3B) Netcredita
Crisis	-.028***	.011	-.027***	-.010**	.002	-.006
	(.01)	(.01)	(.00)	(.00)	(.01)	(.01)
Post1	-.039***	.018	-.041**	-.012**	-.006	.019
	(.01)	(.02)	(.00)	(.00)	(.00)	(.01)
Post2	-.038***	.014	-.034***	.002	.0001	-.003
	(.01)	(.02)	(.00)	(.01)	(.01)	(.01)
Post3	-.026**	.011	-.030**	.011	-.007	.005
	(.00)	(.02)	(.00)	(.01)	(.01)	(.02)
Crisis*Constrained-1	-.149	-.189	.041	.055	.087	.131
	(.14)	(.16)	(.04)	(.06)	(.11)	(.13)
Post 1*Constrained-1	.151	-.113	.013	-.019	-.168	-.020
	(.14)	(.16)	(.04)	(.06)	(.12)	(.13)
Post 2*Constrained-1	.247*	.216	.033	.020	-.217*	-.224*
	(.10)	(.15)	(.05)	(.05)	(.11)	(.13)
Post 3*Constrained-1	.260**	.223	.005	.001	-.274**	-.267**
	(.00)	(.16)	(.05)	(.00)	(.11)	(.13)
lag salesgrowth		-.0002		-.0001		-.0003
		(.00)		(.00)		(.00)
Age		-.012*		-.010***		-.001
		(.00)		(.00)		(.00)
Age^{2}		-.001		-.0001		-.0001
		(.00)		(.05)		(.00)
Fixed Effects	YES	YES	YES	YES	YES	YES
Constant	.484***	.579***	.353***	.518***	-.093***	.018
	(.00)	(.15)	(.00)	(.05)	(.00)	(.10)
Observations	20730	11232	18469	10739	23716	13812
number of groups	3749	3089	3632	3025	4265	3669
obs per group(average)	5.5	3.6	5.1	3.6	5.6	3.8
Adjusted R-squared	.63	.70	.69	.73	.60	.67

* Industry sector dummies makes no difference to results as they are excluded automatically with fixed effects

Table 3.9 Trade credit and cash flow

The dependent variables are 'Tradecreditassets' calculated as accounts payable scaled by total assets, 'Tradedebtorassets calculated as accounts receivable scaled by total assets and 'Netcredita' as accounts receiveable minus payables scaled by total assets. Independent variables include 'Crisis' represents a year dummy variable for the year of financial crisis impact in Ireland(2008), while 'Post1', 'Post2' and 'Post 3' are time dummy variables for the years 2009, 2010 and 2011 respectively.

Crisis*Cashflow-1 represents the SME level of cashflow to assets ratio one year prior to the crisis year. The interactions with 'Cashflow-1' show the effects of 'Cashflow-1' during the crisis and the three years following the onset of the crisis. The models are estimated with fixed effects and include the independent variables of 'Size' represented by the natural logarithm of firm assets, a measure firm cash and bank deposits lagged ' l.cashta' and the age of the firm and the squared age of the firm 'Age^2'.Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and 10% level.

	(1) Tradecreditorassets	(1A) Tradecreditorassets	(2A) Tradedebtorassets	(2B) Tradedebtorassets	(3A) Netcredita	(3B) Netcredita
Crisis	-.024**	.015	-.025***	-.009**	-.010	-.014
	(.00)	(.01)	(.00)	(.00)	(.01)	(.01)
Post1	-.035***	.011	-.040***	-.017***	-.018**	-.012
	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)
Post2	-.033***	.025	-.032***	-.004	-.013	-.006
	(.00)	(.00)	(.00)	(.01)	(.01)	(.01)
Post3	-.039***	.035	-.028***	.002	-.014	-.009
	(.00)	(.00)	(.00)	(.01)	(.01)	(.01)
Crisis*Cashflow-1	-.007***	-.015***	-.0001	.001	.012***	.026***
	(.00)	(.01)	(.00)	(.00)	(.00)	(.00)
Post 1*Cashflow-1	-.004	-.011***	.003***	.005***	.008***	.015***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 2*Cashflow-1	.001	-.007***	-.0001	.001	.010***	.017***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 3*Cashflow-1	.007**	-.009***	.001	.004**	.001	.012***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
lag Size		-.002***		-.001***		-.001*
		(.00)		(.00)		(.00)
l.cashta		-.081***		-.099**		-.015
		(.00)		(.00)		(.00)
Age		-.015***		-.006***		.003
		(.00)		(.00)		(.00)
Age^2		-.0001		-.0001		-.0001
		(.00)		(.00)		(.00)
Fixed Effects	YES	YES	YES	YES	YES	YES
Constant	.377***	.646***	.326***	.457***	-.027***	-.002
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Observations	15117	13393	13546	12730	17332	16321
number of groups	2629	2571	2590	2554	3055	3020
obs per group(average)	5.8	5.2	5.2	5.0	5.7	5.4
Adjusted R-squared	.58	.60	.69	.69	.57	.58

* Industry sector dummies makes no difference to results as they are excluded automatically with fixed effects

These tables provide another robustness check to the hypothesis that financially vulnerable/ constrained firms were net receivers of credit from informal sources over the crisis period and that financially stronger firms played a significant role as financial intermediaries when bank lending was absent.

The results from Table 3.8 show that firms with less assets tangibility at the time of the crisis received significantly more trade credit (Column 1) and extending significantly less over the subsequent years (Columns 3A and 3B), supporting H5. It is likely to suspect given the reasons outlined above that this could be evidence of the involuntary granting of credit. Similarly the results are

consistent for cash flow, i.e. firms with greater cash flow entering crisis extended more trade credit and received less over the post crisis period (2008-2011). Again, my regressions find that older firms tend to receive less credit and extend less.

3.5.1 Impact of macroeconomic factors

Finally in Table 3.10, I test the relationship between trade credit and some macroeconomic factors, including the percentage of credit extended by the banking sector within Ireland and a proxy for the interest rate that is charged to SMEs on bank loans. I use fixed effects estimation and use two different specifications for trade credit finance received (*Tradecreditorst*) which is a proxy for the quantity of credit received and logcreditordays which captures the length of time in which creditors are repaid. The final variable (Netcredit) captures the net credit extended by firms. Overall, the results show that firms with higher levels of cash to assets ratio receive less credit, both in terms of quantity and length of time, controlling for firm specific characteristics and time. In column 1, we observe an inverse relation between dependence on short-term bank finance and trade credit. We would assume this to be the case given that trade credit is generally viewed as a short-term means of finance. This is further support of substitution between trade credit and bank credit and indeed, the counter cyclical nature of trade credit as found in Huang et al. (2010). Furthermore, it highlights the financial vulnerability of firms entering the financial crisis with high dependence on short-term bank finance. As shown in Table 3.5, the firms with the greatest dependence and vulnerability to the crisis required increased trade credit financing from their suppliers.

Recent research shows that net interest margins (ratio of net interest income to average interest earning assets) of Irish Banks declined steadily over the period 1997-2012 and in particular over the period of the financial crisis. The majority of Irish banks' operating income is sourced from the net interest income. As a proxy for the cost of lending to SMEs over the time period, we use the lag value of inter-money market bank rate[29] as an indicator of the cost of credit and other loans to Irish SMEs over the sample time period.

While the inter money market lending rates is a blunt estimation of the rates at which bank credit is extended to SMEs within the Irish economy. The variable 'l.moneymkt' can be considered as a proxy for the cost of bank financing. The higher the cost of money on the international markets, the more banks charge on the money they lend to SMEs. Therefore, we would expect that the higher the cost for external financing, the more we would expect firms to seek trade credit financing. We examine the effect of the lag of the money market rate (the rate at which banks borrow for funding purposes) and the effect of the money market rate on trade credit use. The negative coefficient of interbank lending rates and the amount of trade credit extended and received by SMEs is interesting. In all three columns with the exception of 'credit days', the results show that the higher the money market rate the less credit extended and received in the economy. However, we are unable to detect a significant association between the percentage of credit extended by the banking sector as a proportion of GDP (PcreditGDP) and the level of trade credit due to this being a one country study.

[29] Source: Thomas Reuters DataStream

Table 3.10 Trade credit and bank credit

The dependent variables are 'Tradecreditorst' calculated as accounts payable scaled by turnover, 'Credit days' calculated as the natural logarithm of the number of creditor days. 'Netcredit' as accounts receiveable minus payables scaled by turnover.

'l.loansta' is the lag of the ratio of short-term loans from financial institutions to firm current liabilities, 'l. Turasset' is the one year lag of the ratio of firm profits to assets. l. Cashta is the one year lag of firm cash and deposits scaled by firm assets. 'l. lmoneymkt' is a proxy for the cost of bank funds, calculated as the one year lag of the money market rate. Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and

	Tradecreditorst	Credit days	Netcredit	Net credit
l.Turasset	-.001	-.005***	-.001	-.001
	(.00)	(.00)	(.00)	(.00)
l.loansta	-.003*	.005	.0001	.001
	(.00)	(.00)	(.00)	(.00)
l.irmoneymkt	-.002**	.001	-.004***	-.003**
	(.00)	(.01)	(.00)	(.00)
l.Cashta	-.030***	-.183***	-.058***	-.058***
	(.00)	(.00)	(.00)	(.00)
PcreditGDP				.000**
				(.00)
Time dummies	YES	YES	YES	NO
Fixed Effects	YES	YES	YES	YES
Constant	.197***	3.179***	.126***	.042***
	(.00)	(.02)	(.01)	(.01)
Observations	18368	17643	25753	25753
number of groups	4970	4695	6103	6103
Adjusted R-squared	.69	.70	.57	.58
R-squared overall	.77	.75	.67	.68

* No time dummies are included in column 4 due to correlation with PcreditGDP

While my findings show some support for redistribution and evidence of substitution (H3), the reduction in overall credit extended by the banking sector in Ireland over the period 2007-2011 coincides with a reduction in the level of trade credit extended and received within the SME sector (H1), however as we have seen in the analysis, this is not the case for all sectors and for all firms. Therefore, we cannot find conclusive evidence to support the hypothesis that liquidity shocks are propagated along the supply chain (Boissay and Gropp, 2007; Love and Zaida, 2010) during a systematic shock leading to a reduction in credit to all firms. Nevertheless, given the severity of the crisis, and the fact that firms that would not have difficulty receiving credit from banks in 'normal times' experienced significant difficulties in obtaining funds since the crisis, we

find strong evidence supporting a substitution effect. Firms that can obtain trade credit do so; however the instance of the substitutability may be limited to a period of time. Interestingly, my results do show that larger firms- with greater cash reserves and liquidity at the time of the crisis- extended significantly more trade finance to the less financially liquid firms for a period of time post the onset of the financial crisis. This shows that there is evidence of an adjustment process in financing for some SMEs. On this basis, when I model trade credit using the panel regressions, I show that profitable firms are more likely to voluntarily extend credit, though the period of extension may be limited.

3.6 Limitations and suggestions for further research

The analysis ends in 2011 and it would be important to assess the extent to which profitable firms continued to extend trade credit in subsequent years, when bank financing to SMEs was still very much restricted and aggregate demand remained weak, both in Ireland and the EU. How will the financial crisis impact on trade credit use, survivorship, economic growth and recovery in the long term? My analysis has focused on the substitution and redistribution of financing in surviving SMEs, as at present the data does not provide adequate coverage of failed firms in this study. Extending the analysis to failed firms is an important avenue for future research. While, I used an unbalanced panel in this study, I do not believe the results are influenced by an attrition bias. Subject to data availability, it would be interesting to study the effects on supplier and customer relations. How did trade credit use influence future lines of business relations and growth? Furthermore, quarterly data as opposed to annual data would also improve our understanding in terms of firms' immediate behaviour in the aftermath of shocks to the financial system. Finally, in the case of SMEs,

further research on role of market power and trade contracts is required. This would be an important extension to the research.

3.7 Conclusions

This chapter shows that unlisted financially 'vulnerable' SMEs entering the financial crisis received more trade credit from suppliers and extended less trade credit to their customers in the year of the crisis and thereafter. The chapter is the first to show empirical evidence of a substitution effect in the context of a panel data sample of unlisted European SMEs post the onset of the 2008 financial crisis. The contextual setting for this research makes an interesting case. During this period, there was both a boom in bank lending and a sudden and very dramatic shock to the economy and the SME sector. The timeframe covers the period of economic boom and financial expansion with the effects of the financial crisis and finds evidence of an adjustment process and substitution effect in the financing of SMEs. While there is some evidence that aggregate levels of trade credit declined over the crisis, the data unequivocally shows that trade credit financing has played an important role in the financing of SMEs throughout the banking crisis. I find strong support of a substitution effect between trade credit and bank credit over the recent financial crisis period for financially vulnerable SMEs. I suggest that both redistribution and substitution effects are best specified in terms of the financial position and financial strength of firms at the time of the crisis rather than the age or size of the firm. The policy implications of this paper are important in light of the recent financial crisis. If during a financial crisis, larger, more financially stronger and liquid firms have the ability to redistribute credit to financially constrained SMEs, this provides a source of finance to firms that otherwise

would not be available to them. Therefore any policy that restricts the profitability, cash reserves and access to finance for larger /more financially liquid firms has adverse effects for SMEs by restricting their ability to receive trade credit in place of bank finance when bank lending is restricted. Given the importance of SMEs in terms of national output and employment, this issue has potential significance for economic recovery and avoidance of compounding the growth crisis. The late payment for goods is particularly important for the working capital financing of micro and financially weaker SMEs. The Small Business Act (2008) makes specific reference to trade credit in its 10 point plan and highlights that on average SMEs wait between 20 and 100 days for the payment of goods, with one in four insolvencies due to late payment. Therefore, this is clearly an issue for further consideration and importance for other countries within the EU. The results show that while trade credit is used for transaction purposes within the economy in non-crisis periods, there appears to be some degree of substitutability between the cost of bank credit and the use of trade credit as measured by the proxy for the cost of inter-bank lending. Finally, while the results of this study also suggest that some involuntary use of trade credit is evident in my data, the findings robustly show that financially strong firms are more likely to extend finance, even though the period of extension maybe limited.

Chapter 4: Bank credit and trade credit use amongst European SMEs over the financial crisis. [30]

4.1 Introduction

As discussed in Chapter 3, the financing behaviour and decisions of Small and Medium Sized enterprises (SMEs) often differs from large firms for a number of reasons. A growing number of studies, however, also highlight the importance of institutional and country specific factors influencing the financing behaviour of SMEs (Beck et al., 2003; Psillaki and Daskalakis, 2009), and some studies further point to the observed differences between listed and unlisted small firms (Brav, 2009; Joeveer, 2013). Due to information asymmetries pertaining to private firms, Brav (2009) shows that for a sample of private and public UK firms, private firms rely almost exclusively on debt finance due to the relative high cost of private equity compared to public equity and their aversion to ownership dilution. Due to the high dependence on debt finance, capital structures of small firms are particularly sensitive to changes in firm performance. Joeveer (2013) finds that for a sample for listed and unlisted firms, firm size and tangibility are positively associated with leverage for listed firms, while for unlisted firms, this relationship is not robust, but instead, findings indicate that country specific variables are a greater indicator of leverage for unlisted firms. For these reasons, it is assumed that higher shareholder and creditor protection rights are associated with higher levels of leverage for unlisted firms.

[30] This study was presented at the 10th ECB European Commission COMPNET workshop September 2014, and at the 8th Portuguese Finance Network Conference, 2014.

As highlighted in earlier chapters, research has shown that external finance availability is limited for SMEs by the presence of information asymmetries (Petit and Singer, 1985; Binks and Ennew, 1996; Berger and Udell, 1998). Poutziouris (2002) concludes that often there is an aversion to external equity among family owned businesses due to succession considerations and managerial independence, and these reasons are commonly cited for Pecking Order behaviour among SMEs (Bolton, 1971; Cosh and Hughes, 1994; Chittenden et al, 1996; Jordan et al, 1998). Some studies have also examined the relationship between the size of the SME sector and the overall business environment, such as entry and exit costs and the degree of credit information sharing (Ayyagari, Beck and Demirguc-Kunt, 2007).

This chapter extends to this literature and examines the financing of SMEs and in particular, the use of trade credit among a sample of European SMEs over the financial crisis period. While this research is novel in terms of the size and coverage of data for SMEs, it is also the first study that examines a large sample of SMEs using actual firm level accounting data. As highlighted by the OECD European Scorecard (2013), one of the biggest challenges facing research on the changing conditions and access to finance for SMEs are limits in actual accounting data to make cross country comparisons, and this difficulty is also compounded by the lack of conformity on defining SMEs across countries. In this study, the data is comparable and SME definition criteria are applied equally. The research conducted in this chapter draws upon existing findings in Chapter 3 on the role of trade credit use among SMEs and examines if institutional and accounting standards specific to individual countries within the European area influence SME financing behaviour. This is the first study that

assesses the impact of these institutional and country level factors on the working capital of SMEs in the aftermath of the 2008 financial crisis. The chapter also applies a robust panel data methodology using firm and country level data.

The findings of this chapter illustrate that not only do firm specific characteristics influence finance for SMEs, but country level influences at the macro level have significant effects on SMEs financing and often survival too. In particular, the results demonstrate significant differences in the levels of trade credit use across countries with both financial, political and economic risks influencing, both bank credit and trade credit. The results show that net credit extended is highest in common law regions, such as Ireland and the United Kingdom, however, despite the traditional perception that trade credit use is associated with regions with lower levels of financial development, this chapter argues that trade credit played a significant role in supporting financially vulnerable SMEs throughout the crisis as indicated by the increased levels of credit extended by firms with larger cash stocks and reserves. The results of this chapter also illustrate that trade credit availability is likely to reduce the propensity of firm failure in some cases.

The chapter is structured as follows. Section 2 is the literature review, which discusses the European SME performance over the crisis and the working capital of SMEs. Section 3 examines the impact of institutional factors on financing. Section 4 outlines the methodology and data used, while Section 5 discuses results and Section 6 concludes.

4.2 Literature review

4.2.1 European SME performance over the crisis

SMEs in Europe are an important source of employment and output. It is estimated they provide two out of every three jobs and account for more than 58% of gross value added (IIF Bain and Company, 2013). SME size and how they are managed vary significantly across countries. In Italy, Portugal, and Spain, SMEs account for almost 20% more employment than the European average, while German SMEs are typically larger and characterised by a separation of ownership and management, in comparison to closely held and family managed SMEs in Italy and Spain. Throughout the financial crisis, however, it is fair to say that SMEs across Europe have been adversely affected by both dramatic reductions in demand and in bank lending, upon which most are heavily reliant for working capital and short-term finance. According to European Commission data, since 2008, loans of less than €1 million to SMEs have declined by an average of 47 percent since the pre-crisis peaks, with falls in the region of 66 percent in Spain and 82 percent in Ireland. GDP per capita growth has fallen in the entire countries sampled, the most severe reductions in GDP per capita can been seen in Greece, Ireland, Latvia Lithuania and Finland. Average growth and recovery since 2011 in GDP per capita, however, has been strongest in Lithuania, Ireland, Poland, Sweden and Germany, with Sweden and Germany appearing to be performing the best along with Ireland, with Portugal and Italian SMEs faring worst. From the sample of European countries presented in this study, Spanish SMEs report the greatest losses in employment, turnover and profitability compared to SMEs in other European countries. These findings also corroborates with recent ECB SAFE reports. It has also been

found that German and Swedish SMEs had greater financial reserves and less financial indebtedness at the onset of the crisis, while these countries also fared better in terms of their global competitiveness measures.

Financial indebtedness and working capital management has been a major issue for policy makers. Ratios of private sector credit to GDP have exceeded 200 percent in Ireland, Spain and Portugal, while remaining around the 100 percent mark for Germany, Sweden and France.[31] The proportion of non-performing loans is found to be highest in Ireland, Portugal, Spain and the United Kingdom. The comparison in non-performing loans is quite stark at 20 percent in Ireland in comparison to 2 percent for Sweden in 2012. Research has also found significant differences in the types of bank finance that SMEs are reliant on. In Ireland, for example, SMEs are found to be more reliant on bank overdrafts with over 60 percent of Irish SMEs using this source of finance compared to 7 percent of Swedish SMEs (Mazars, 2010). International SMEs create more employment, while German SMEs are larger, more innovative and more involved in exporting in comparison to other European countries.

4.2.2 The role of working capital and trade credit among European SMEs

The nearest study to my knowledge which examines the role of trade credit among European SMEs is Carbó-Valverde et al. (2012). They examine the role of trade credit for a sample of Spanish SMEs over the period of 2004 to the onset of the financial crisis in 2008. They find that financially constrained SMEs depend on trade credit to finance capital expenditures at the onset of the crisis. The findings of their study indicate a significant role for credit and

[31] European Commission Working Paper "Exploring the steady-state relationship between credit and GDP for a small open economy" (EC, 2013),

investment amongst SMEs by modelling those that are constrained in their access to bank finance. Similarly, using SAFE[32] data, Casey and O'Toole (2014) find that in the case of SMEs denied access to bank credit for working capital purposes during the crisis, they were more likely to turn to and apply for trade credit off other firms. This paper extends on these pieces of research, by using actual firm level accounting data over the recent crisis period and examining the role of which country and institutional specific factors influence access to finance for SMEs for working capital purposes.

4.3 The role of institutional differences on financing

While Chapter 2 and Chapter 3 focus on firm level characteristics and access to finance for SMEs, this chapter focuses more on the institutional and country specific factors and can be analysed from the following perspectives.

4.3.1 Bank concentration and ownership across Europe

Since the onset of the financial crisis in 2008, there has been a renewed interest in the relationship between banking market competition and the level of private sector credit extended by banks. Drakos (2013) found that bank loan terms and conditions for European SMEs, particularly in the sovereign debt crisis countries (i.e., Greece, Ireland, Spain and Portugal) experienced considerable tightening in credit conditions above the Euro zone average. Similarly, Cull, Soledad and Pería (2013) examine bank lending in Eastern European countries

[32] As discussed in Chapter 1, SAFE (Survey on Access to Finance) is a European Commission survey on approximately 5,000 SMEs across Europe that are surveyed on a 6 monthly basis. While the data is quantitative in nature, the majority of variable are categorical and binary in nature and reflect the opinions of SME owner/managers at a point in time.

over the financial crisis period and find noticeable differences between domestic, foreign and government-owned banks in terms of credit growth. For a sample of Finish banks, Fredriksson and Moro (2014) found that SME performance is a major factor in explaining the risk-adjusted profitability of banks. This result is consistent with the belief that greater market power increases banks incentives to produce more information on potential borrowers, consistent with the information-based hypothesis.

Ryan, O'Toole and McCann (2014) extended this research to examine the relationship between bank market concentration and SME financing constraints using a sample of SMEs across 20 European countries between the years 2005-2008. Their paper finds that increased bank market power is associated with lower levels of investment among SMEs due to restricted loan supply and higher lending rates. Conversely, using a sample of 14,000 European publicly traded firms, Ratti, Lee and Seol (2008) show that firms are less financially constrained in countries with highly concentrated banking sectors.

As well as changes in the level of concentration and competition within the European banking sector, the question is 'how does this impact on access to finance?' Hanedar, Broccardo and Bazzana (2013) who investigate the collateral requirements for SMEs in less developed countries in Eastern Europe and Central Asia find that while information-sharing mechanisms are associated with improved credit availability, the collateral requirements in SME loan contracts are not less restrictive in countries that feature more intensive information-sharing mechanisms than in countries that do not. These differences in lending mechanisms are further highlighted by Bartoli, Ferri, Murro and Rotondi (2013) who examine SME lending technologies in Italy and find that

banks tend to use both transactional and relationship lending technologies. Banks that use relationship lending technologies produce more soft information which ultimately decreases the probability of credit rationing. According to Revest and Sapio (2012), financial systems across Europe can be differentiated into ones that are more banking based, such as German and Scandinavian countries, and others, such as the UK and US which are more market-based. Companies domiciled in countries which are defined by bank-based financial systems, such as Germany and France, tend to display a greater reliance on networks and long-term relationships with creditors. These differences, they find, are particularly important for the financing of technology-based small firms.

Another aspect in the poor performance of European banking system over the past 6 years has been the contagion of financial debts and the dramatic restrictions in inter-bank lending. De Bruychere, Gerhardt, Schepens and Vennet (2013) find that banks with weak capital buffers and weaker funding structures, and those which are based on less traditional banking activities were particularly vulnerable to risk spill-overs. While at the country level, the debt ratio is the most important driver of contagion (Lane and McQuade, 2013).

4.3.2 Collateral requirements for European SMEs

Given the fact the SMEs are particularly sensitive to information asymmetries due to their often opaque nature, it is important to assess the role to which changes in collateral requirement are also likely to have influenced access to finance. It is expected that countries with less developed financial sectors are associated with more stringent in terms of the collateral requirements (Menkeff

et al. 2006; Beck et al. 2006). However, Hanedar et al. (2014) finds that the presence of collateral in loan contracts is determined mostly by the borrower's characteristics for a sample of Eastern European SMEs. They find that collateral requirements are not less restrictive in countries that feature more intensive information-sharing mechanisms.

Research has also shown that institutional accounting standards and requirements vary across regions (Rajan and Zingales, 1995; Beck, Demirguc-Kunt and Maksimovic, 2008) and ultimately influence the availability and cost of finance for SMEs (Berger, 2006).

4.3.3 Legal origin and finance availability

La Porta, Lopez-de-Silanes, Shleifer and Vishney (1997, 1998) illustrated a relation between legal origin, investor protection and the availability of finance. In addition to legal origin, firm size and the degree of information asymmetry also significantly influences the availability of finance. Smaller firms tend to face higher monitoring costs for lending (Boocock and Woods, 1997), the most significant reason for the perceived cost difference between internal and external funds (Berger and Udell, 1998). For these reasons, trade credit is likely more important in countries where creditor protection is weaker (Burkart Ellingson, 2004). Notwithstanding this, trade credit relationships between firms and suppliers could mitigate the country level institutional factors through the acquisition of information from on- going business and through the enforcement and renegotiation/liquidation process (Fishman and Love, 2003). Marotta (2005) finds that trade credit is mostly used in Italy compared with other European countries.

4.3.5 Bankruptcy law

Finally, several studies have examined the relationship between a country's bankruptcy laws and the entrepreneurial environment (Armour and Cumming, 2008; Lee, Yamakawa, Peng and Barney, 2007). The severity of bankruptcy laws on debtors may limit the ease of doing business, but also limit the availability of finance to SMEs. A bankrupt debtor may obtain a discharge from outstanding credit obligations after a period of time and obtain a fresh start from bankruptcy. While this has implications for the level of business start-ups and investment, it undoubtedly has implications for the propagation of liquidity shocks in the SME sector. Both personal discharge and corporate discharge periods are found to vary significantly both across regions and over time. In the UK for example, discharge periods in recent years have been reduced from 3 years to 1-year and in Ireland from 12 years to 3 years. Research has found that contrary to popular belief creditor rights have remained stable for most countries over time (Djankov, Mcliesh and Shleifer 2007). For many years in European countries, no discharge was available for personal indebtedness (Armour and Cumming, 2008), however over the financial crisis, bankruptcy laws have been relaxed across countries including the UK, Ireland, Belgium and Italy.

Vanacker, Heughebaert and Manigart (2014) examined the relationship between personal bankruptcy laws across six European countries and their influence on the financing behaviour of new technology-based firms (NTBFs). They show that venture capital investors strengthen the relationship between national laws and the financing of private firms. Better shareholder protection rights are positively associated with increased levels of external equity finance and larger

levels of equity finance being raised. Research has also found that international investors rely on financial and accounting information to assess investment opportunities and risk, particularly for international venture capital investments (Cumming and Dai, 2010). These findings support existing research that has shown that external equity is very important for high growth SMEs and particularly in the case of new high technology-based firms (Hogan and Hutson, 2005).

To take account of institutional differences in creditor rights and differences in legal requirements and obligations of SMEs across regions, in this study, the analyses includes variables that capture regulatory quality, the rule of law and enforcement and governance measures. The measures also capture the ease of access to finance for firms both large and small in size. World Bank Governance Indicators 2013 are used (WBGI).

To summarise, some the main hypotheses of this chapter are

H1 Net credit remains unchanged in response to a financial crisis

H2 The change in trade credit following financial crisis is related to the financial liquidity of the firm

H3 Trade credit acts as a substitute for bank finance for unlisted SMEs during the financial crisis

H4 SMEs access to finance for working capital purposes and the level of trade credit used are unrelated to country level factors

H5 SMEs reliance on trade credit finance is unrelated to the level of institutional and creditor rights protection will have.

4.5 Methodology and data analysis

4.5.1 Methodology

The first stage of the research is to examine the relationship between the financial position of SMEs entering the crisis and their subsequent financial position and use of trade credit financing. However, the difference with this stage of the research as opposed to Chapter 3 is that I now include and control for differences in economic and institutional factors that vary across country and time as well as estimating the likely impact that these factors have on overall SME performance. The first stage of the methodology is to analyse the levels of trade credit extending and received within the European SME sector and the differences among the financial position of SMEs at the time of the financial crisis, and hence their subsequent extension or net receipt of trade credit throughout the subsequent crisis and post crisis years.

Model (1) and (2) for trade credit take the form of the equation below, where t and i indicate the time period and individual SMEs, α is the firm fixed effect. X is a vector of firm specific control variables and ε denotes the error term. To examine the responses of SMEs to the crisis, I use the interactions of the financial position of the firm in the pre-crisis year (2007) with the crisis year (2008) and the post-crisis years (Postcrisis). $FST_{i(-1)}$ represents the financial strength of SME (i) measured in the pre-crisis year and this value is fixed. Financial strength or position of the firms is measured using the four factors above in separate regressions. ε_{it} which represents the error term is comprised of unobserved time invariant ($\cap_i$) and time variant (V_{it}) factors. Variants of this approach are applied.

(Model 1) Firm fixed effects and financial position entering the crisis.

Equation 7 Firm fixed effects and financial position entering the crisis

$$TC_{it} = \alpha_{it} + \beta_1 Crisis + \sum X_{it-1} + \varepsilon_{it} \quad \text{, where } \varepsilon_{it} = (\eta_i + V_{it}).$$

Where TC_{it} denotes trade credit for firm i at time t.

Causal factors that are time invariant, including industry effects which influence trade credit are captured by the fixed effects. All other explanatory variables change over time and are predicted to influence the level of trade credit. These include age, growth in sales (salesgrowth), cash reserves (Cashta), level of short term bank debt scaled by firm assets (loansta), size (log of total assets) the level of economic activity indicated by GDP per capita (Gdppcg). Table 4.1 shows the significance of an SME financial position and use/provision of trade credit. A Hausman test was also conducted and this showed in favour of the fixed effect regression over random effects. In model (2), the same estimation is conducted, however the estimate the net level of trade credit extended captured by ($NetTC_{it}$). This estimates the net levels of credit extended (i.e. levels of trade credit extended minus trade credit received) based on the firms' financial position entering the financial crisis. The results from model (1) and (2) and variants of their approach using the dependent variables of *Tradecreditors* (which indicates levels of credit received), *Trade debtors* (which shows levels of trade credit extended) and *Net TC* (which indicates net levels of credit extended) are outlined in Table 4.7.

(Model 2) Net levels of trade credit extended and the financial position entering the crisis.

Equation 8 Net levels of trade credit extended and the financial position entering the crisis

$$NetTC_{it} = \alpha_i + \beta_1^* crisis + \beta_2^* \text{Postcrisis} + \beta_3^* \text{FST}_{i(-1)} * crisis + \beta_4^* \text{FST}_{i(-1)} * \text{Postcrisis} + \sum X_{it-1} + \varepsilon_{it}, \text{where } \varepsilon_{it} = (\eta_i + V_{it})$$

In model (3), I examine the change in trade credit use relative to bank credit over the crisis. This estimation contains the same structure with interactive dummy variables as in model (1) and (2), however here the dependent variable is captured by the ratio of net credit extended scaled by the level of bank credit received and outstanding. This way, it is possible to capture changes in net credit relative to bank credit for SMEs dependent on their financial position. There are illustrated in Table 4.8.

(Model 3) An estimation of the substitution between trade and bank credit

Equation 9 An estimation of the substitution between trade and bank credit

$$\frac{NetTC}{Bankcredit_{it}} = \alpha_i + \beta_1^* crisis + \beta_2^* \text{Postcrisis} + \beta_3^* \text{FST}_{i(-1)} * crisis + \beta_4^* \text{FST}_{i(-1)} * \text{Postcrisis} + X_{it} + \sum X_{it-1}\ \varepsilon_{it}, \text{where } \varepsilon_{it} = (\eta_i + V_{it})$$

Finally in model (4) the relationship between macroeconomic, financial and institutional differences on the level and use of trade credit finance for European SMEs is analysed. Model (4) examines the relationship between the net levels of credit extended and institutional and regulatory factors, based on the International Country Rules Guide (ICRG) factors and levels of regulation across regions, as well as country dummy variables. It is important to note that

the inclusion of the Composite Risk rating is an individual country ranking based on economic, political and financial risk factors. These factors include a combination of variables including GDP per capita growth, Inflation, Government budget balance as a percentage of GDP, political stability, legislative strength, and exchange rate stability, foreign debt as a percentage of GDP and debt service payments. The results from model (4) are outlined in Table 4.9

(Model4) Trade credit use and macroeconomic and institutional factors over the crisis.

Equation 10 Trade credit use and macroeconomic and institutional factors over the crisis

$Netcredit_{it} = \alpha_i + \beta_1^* \sum X_{it-1} + \beta_2^* \sum Z_{it} + \sum C_{it}\ \varepsilon_{it}$, where $\varepsilon_{it} = (\eta_i + V_{it})$,

and $\sum X_{it-1}$ is the sum of individual firm characteristics described above lagged, and $\sum Z_{it}$ are the firm specific industry fixed effects and $\sum C_{it}$ are the country effects.

4.5.2 The data

The data consists of SME financial statement data obtained from the Amadeus Bureau Van Dijk database. It covers SME balance sheet and profit and loss accounts over the period 2003-2012. SMEs are defined according to the European Commission (2005) criteria, which includes firms that employ less than 249 workers in a given year and have either an annual turnover of less than €50m or a balance sheet total assets of less than €43m. In this study, the number of employees and the balance sheet totals of each SME are used as scales in each year. The data is also combined with data obtained from the World Bank

Financial Development index and the IMF to capture country level and macroeconomic differences and financial development indicators across Europe.

The final sample contains almost 2.1 million firm-year observations on European SMEs over the period 2003-2012. In total, the sample contains approximately 283,360 firms across 15 European countries. Firm industry sectors are categorised according to three digit NACE 2007 codes and firms are assigned to 20 separate industry sectors. The analysis excludes all financial and insurance based companies, in line with existing empirical studies, as well as public utilities such as public transport and postal services.

The criteria for the sample are as follows:

- All active firms employing between 2 and 249 employees in each of the sample years.
- All firms with balance sheet total assets of greater than €43,000,000 or annual turnover greater than €50,000,000 in any of three consecutive years of the sample years are excluded.
- All financial variables are winsorised at the 1% and 99% level. This is to mitigate the effect of extreme outliers in the data. The data excludes subsidiary firms. Furthermore we eliminate values that imply trade credit of longer than one year.

Firms employing 10 persons or fewer in a given year are classified as Micro enterprises, while those that employ between 10 and 49 workers are labelled small, and finally, enterprises employing between 50 and 249 employees are classified as medium sized enterprises[33].

[33] Link to the international country risk guide
http://www.prsgroup.com/ICRG_TableDef.aspx

The Anti-directors rights (ADRI) index (La Porta et al., 1997) capture shareholder protection, however these are time invariant and do not capture changes in financial liberalisation, but World Bank variables are available for most years. The data we also use are the International Country Rules Guide (ICRG) data. The ICRG data uses estimates for country-level risk rankings to capture factors such as protection of creditors, governance and financial reporting quality, which may vary overtime, especially for developing countries.

4.5.3 Country effects

Since data size and quality vary significantly with country and this is an unbalanced panel, it is important to check that the results are not being driven by any one country. As pointed out by previous studies which have used Amadeus, the data collection is homogeneous and representative across regions, and sectors are narrowly defined. In addition, data on manufacturing and services across countries is quite good, and industry coverage is stable and representative across countries and over time (Gomez- Salvador et al., 2004). Despite the benefits of Amadeus and its noted representativeness across countries, its data availability for Germany is noticeably less given the fact that German SMEs are not legally forced to disclose financial data (Desai et al., 2003). While the regressions include country level dummy variables as a robustness measure, we also employ a weighted least squares specification as a robustness check to the regressions to control for any biases that may arise from countries whose SMEs are over represented in the total sample. The weighting

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http://www.oecd.org/cfe/smes/Scoreboard_2013_extract_chapter2.pdf

scheme uses the inverse of the proportion of country observations, therefore increasing the importance of the countries with the lesser number of firms as a proportion of the total sample.

The weighting least squares procedure is as follows: The weighted measure is simply the number of observations for country i scaled by the total number of observations for the total sample. To get the inverse of the weight, the measure of 1 over the individual country weight is used as illustrated below.

Equation 11 European sample weighting

$$\text{Weighting Wi} = \frac{1}{\frac{Ci}{\sum_{i=1}^{n} Ci}}$$

Where C_i = The number of observations for country i and n= number of observations for the total sample.

4.5.4 The variables

Firm level variables used include measures of short-term debt finance; firm loans; firm age; cash stocks; operating revenue, sales growth, trade credit received, trade credit extended and total debt finance[34]. Total debt is calculated as long-term debt plus short term debt (loans) or (current liabilities). Total bank financing is calculated as total amount of long term debt financing outstanding by the firm plus short-term bank finance. Debt overhang is calculated in similar fashion to Ryan et al. (2008) (Calculate as total debt/ capital stock), while Investment = *the* Accumulation of fixed assets (accounting for depreciation, amortisation and/ or revaluations) in a given year, normalised by the stock of fixed assets at the beginning of the year). Other variables used in the study capture the level of collateral accounted in firm balance sheets, a measure of net

[34] Please see Table 4.12 for descriptive statistics of firm variables used in the study.

trade credit received (Net received) calculated as accounts payable minus receivables scaled by sales, and also a measure for whether or not the SME has survived or not. For this, a variable for firm '*Fails*' is also included. *Fails* represent a small proportion of the total sample of firms; however, given the importance of SMEs across the Euro area in terms of output and employment, I decided to model the influence of some of the factors outlined above on SME survival.

Country level Control variables

The study includes a number of country level control variables. These include controls for economic growth, inflation, as well as financial sector development, the degree of banking concentration and a measure for competition in the banking sector. The analysis uses other institutional factors, such as creditor rights and a dummy variable representing legal origin of each country, similar to La Porta et al. (1998). In terms of macroeconomic indicators, a measure of interest *rates*[35] and measures for *GDP* per capita are included. Interest rates are an important factor to measure the influence of the cost of bank finance for SMEs. For many years now, there has been a long established relation between financial sector development, institutional factors and economic growth. Raghuram and Zingales (1998) examine whether financial development facilitates economic growth by scrutinizing one rationale for such a relationship, which predict that financial development reduces the costs of external finance to

[35] Interest rate data sourced at: http://ec.europa.eu/enterprise/policies/finance/data/enterprise-finance-index/access-to-finance-indicators/loans/index_en.htm [Accessed: 25th July 2014]

firms. Firms using little debt financing will be capital constrained and grow slower (King and Levine, 1993, Rajan and Zingales, 1998). As stated earlier, a composite index for country level risk, political and regulatory risk obtained from the ICRG database are included.

As a robustness check and to avoid the presence of multi-collinearity among variables, a Variance Inflation Factors (VIF) tests are reported for all regressions as well as a correlation matrix of variables included in regressions[36].

Descriptive statistics

Initial examination of the data shows that average debtors over the sample period are longest in the countries of Greece, Portugal, Italy and Spain and shortest in the countries of Finland, Germany, the UK and Lithuania. Table 4.1 shows the distribution of SMEs and relative proportions of observations on SMEs from each country region. The countries of France, Italy, Poland, Portugal, Spain, Sweden and the UK account for the majority of observations in the sample, while the countries of Greece, Latvia, Lithuania, Germany and Ireland each contribute the smallest number of observations on SMEs to the total sample. While these figures are representative and in proportion to country size, as stated, the noticeable outlier in this sample is Germany. Germany representing the largest European economy contributes one of the least in terms of the quantity of SME observations in the sample (only information on 4,000 SMEs of an estimated population of over two million SMEs[37]). In addition, official figures show that German SMEs are among the best performing SMEs

[36] None of the variables in the correlation matrix have an association above .7 indicating that the presence of collinearity amongst the explanatory variables is low and unlikely to bias our results.

[37] See http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2012/germany_en.pdf [Accessed 11th November 2014]

and environment for SMEs to do business within Europe and in general are larger in size than the European average.

Table 4.1 European sample size per country per year

Sample size per country

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
1 Belgium	6,507	6,538	6,533	6,497	6,505	6,475	6,492	6,414	6,349	618	58,928
2 Finland	9,196	10,451	10,581	10,890	10,242	8,231	9,113	8,807	9,709	2,335	89,555
3 France	34,871	37,255	37,267	37,262	36,915	36,898	36,933	36,907	36,823	4,046	335,177
4 Germany	391	656	1,178	2,133	2,414	2,630	2,983	2,806	2,342	43	17,576
5 Greece	503	505	508	509	508	507	533	684	587	592	5,436
6 Hungary	50	187	627	1,358	8,462	3,984	9,236	8,944	8,880	7	41,735
7 Ireland	1	10	190	1,764	3,328	3,820	3,966	4,092	3,903	412	21,486
8 Italy	8,833	8,490	8,806	10,124	10,300	10,008	10,006	9,786	10,960	236	87,549
9 Latvia	740	932	932	928	927	932	946	959	961	191	8,448
10 Lithuania	1,188	1,418	1,437	1,415	1,402	1,407	1,414	1,395	1,387	69	12,532
11 Poland	7,512	7,622	9,017	15,631	16,587	20,657	38,255	11,305	6,582	0	133,168
12 Portugal	363	407	383	25,530	25,607	25,777	25,466	25,825	25,806	5	155,169
13 Spain	41,788	44,460	45,741	46,514	47,138	48,377	49,030	48,807	48,863	234	420,952
14 Sweden	44,062	47,678	47,747	47,769	47,745	47,745	47,743	47,774	47,578	35,056	460,897
15 United Kingdom	19,097	19,928	20,369	21,319	22,374	23,833	24,599	24,197	23,657	3,941	203,314
Total	175,102	186,537	191,316	229,643	240,454	241,281	266,715	238,702	234,387	47,785	2,051,922

Table 4.2 shows a breakdown of industries in the sample. In total, using NACE 2007 index codes, a total of 20 separate industry sectors are included. The sectors of construction, manufacturing and wholesale trade represent the largest proportion of SME observations within the sample and represent over 51 percent of the total sample. The two grouped sectors of public utilities and finance and insurance based firms are excluded. Each of the remaining 15 sectors approximately account for between 1 and 7 percent of the total sample. Overall, the sample contains a broad and representative mixture of sectors.

Table 4.2 Industry sectors across European Sample

	Firm year observations		Year											
Industry sector	NACE 2007	Nac	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	%
Agriculture, forestry, fishing	11 (1110-1159)	1	4,195	4,452	4,567	5,456	5,904	5,733	6,617	5,701	5,660	1,812	50,097	2.44
Mining, Quarrying and Oil and Gas Extraction	21 (2111-2139)	2	692	736	738	935	983	997	1,097	996	970	115	8,259	0.40
Utilities	22	3	0	0	0	0	0	0	0	0	0	0	0	0.00
Construction	23 (- 2389)	4	25,095	26,773	27,261	32,833	33,871	33,915	37,009	33,712	33,087	7,623	291,179	14.17
Manufacturing	31-33	5	35,581	37,219	38,468	48,363	50,727	50,531	56,018	50,225	49,224	7,196	423,552	20.61
Wholesale trade	41, 42	6	31,248	32,639	39,082	33,786	40,710	41,543	45,705	40,387	39,515	5,736	350,351	17.04
Retail trade	44-45	7	14,769	15,790	16,088	19,551	20,325	20,057	22,724	19,876	19,664	5,021	173,865	8.46
Transportation and warehousing	48-49	8	10,659	11,252	11,481	13,026	13,499	13,557	14,542	13,384	13,247	3,580	118,227	5.75
Information and Cultural industries	51	9	2,784	2,997	3,092	3,518	3,729	3,794	4,294	3,605	3,516	614	31,943	1.55
Finance and Insurance	52	10	0	0	0	0	0	0	0	0	0	0	0	0.00
Real estate and rental and leasing	53	11	4,870	5,129	5,217	6,199	6,771	6,943	8,593	6,714	6,441	1,484	58,361	2.84
Professional, Scientific and Technical services	54	12	13,594	14,924	15,205	17,503	18,360	18,444	20,498	17,703	17,404	5,241	158,876	7.73
Management of company and enterprises	55	13	1,135	1,243	1,310	1,259	1,261	1,274	1,323	1,297	1,285	222	11,609	0.56
Administrative and support, Waste management	56	14	6,506	7,063	7,239	8,479	8,935	9,025	10,020	8,970	8,856	1,764	76,857	3.74
Educational services	61	15	2,643	2,889	2,963	3,550	3,676	3,712	3,942	3,750	3,720	1,126	31,971	1.56
Health care and social assistance	62	16	4,871	5,408	5,559	7,371	8,099	8,347	9,179	8,514	8,382	1,254	66,984	3.26
Arts, Entertainment and Recreation	71	17	2,387	2,616	2,702	3,035	3,252	3,268	3,527	3,369	3,351	729	28,236	1.37
Accommodation and Food services	72	18	7,528	8,347	8,463	11,074	11,560	11,308	12,125	11,466	11,398	2,033	95,302	4.64
Other services except public administration (beauty salons, repair shops etc)	81	19	6,238	6,709	6,865	7,942	8,320	8,317	9,004	8,511	8,325	2,196	72,427	3.52
Public Administration	91-92 + other	20	303	346	358	412	467	511	493	421	344	171	3,826	0.19
		Total	175,098	186,532	196,658	224,292	240,449	241,276	266,710	238,601	234,389	47,917	2,051,922	100.00

In Table 4.3, the study concentrates to the financing of SMEs across the entire sample. Table 4.3 shows the average number or period of debtor collection days for SMEs across regions represented by their median values. As the table shows, SMEs in general in the countries of Greece, Italy, Portugal and Spain have the longest levels of debtors' collection days across the sample. The shortest lengths of debtor days are observed in the countries of Finland, Germany, the United Kingdom and Latvia and Sweden.

Table 4.3 Mean debtor days for SMEs across country

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2003-2012
Belgium	76	73	74	75	74	69	70	71	70	69	72
Finland	28	28	29	30	30	28	29	32	31	31	30
France	60	59	59	60	59	57	56	56	55	56	58
Germany	33	32	31	31	28	25	27	28	27	33	30
Greece	124	127	132	133	134	134	135	143	143	127	133
Hungary	49	44	48	47	47	45	50	52	54		48
Ireland	26	25	24	36	42	42	44	47	48	60	39
Italy	83	79	97	98	96	92	102	101	99	101	95
Latvia	35	36	34	34	35	36	43	42	38	38	37
Lithuania	56	57	55	51	51	52	65	62	59	61	57
Poland	56	53	58	59	57	58	62	64	64		59
Portugal	106	105	104	107	107	110	120	125	131	135	115
Spain	90	91	94	96	96	90	99	101	100	86	94
Sweden	34	33	34	34	34	32	31	33	33	31	33
United Kingdom	47	46	45	46	46	44	37	36	35	39	42
Average per year	60	59	61	62	62	61	65	66	66	67	63

Table 4.4 illustrates the observed relationship between SME financial characteristics and the level of trade credit finance they receive both before and after the financial crisis. The distribution of firms by their characteristics and the level of trade credit they receive are split into 4 quartiles. In this case trade credit received is measured by the individual SME's level of accounts payable outstanding scaled by their level of assets. Pre-crisis represents the years of 2003-2007, while the post-crisis period is measured as the years 2008 to 2012. The figures illustrate a number of interesting findings. For the sample, the figures show that in general both older, larger and firms with greater revenue turnover in general receive more trade credit, and firms with the largest cash reserves and sales growth receive less trade credit up to the final quartile. The difference between the pre-crisis and post-crisis years are that firms with the greatest cash reserves receive less trade credit during the crisis period and the older firms are more likely to receive trade credit over the crisis period. Firms with the largest sales growth appear to receive less trade credit finance over the crisis years in comparison to pre-crisis years. While these figures are purely

correlations and do not control for a number of important contributing factors, such as contextual setting, they do provide some interesting initial insights.

Table 4.4 Firm characteristics by levels of trade credit received

Pre-crisis' represents the years preceeding the financial crisis (2003-2007) and crisis represents the onset of the financial crisis and beyond (2008-2012) * All figures are represented by mean values*

	1st Quartile		2nd Quartile		3rd Quartile		4th Quartile	
	Pre crisis	Crisis	Pre crisis	Crisis	Pre crisis	Crisis	Pre crisis	Crisis
Size (log total assets)	13.6	13.9	13.6	13.8	13.8	13.9	14	14
AGE	13.7	18	16	21	20	23	16.5	22
Opprev	3.18	1.8	2.54	1.67	2.15	2.15	15.9	3.8
Loansta	0.07	0.07	0.09	0.09	0.13	0.121	0.11	0.122
Cashta	0.19	0.153	0.2	0.196	0.17	0.17	0.13	0.134
Employees	18	18	20	22	29	30.6	30	30.1
Sales growth	0.2	0.01	0.18	0.027	0.14	0.05	0.18	0.07
Total debt/ Assets	3.45	1.54	1.37	0.68	0.61	0.6	2.1	1.05

In Table 4.5, the levels of trade credit received according to industry sector are reported. Industry sectors of management, wholesale and information and cultural industries receive the highest levels of trade credit finance as measured by the ratio of accounts payable to firm assets, while the industry sectors of agriculture, accommodation and food and healthcare receive the lowest levels of trade credit finance as a proportion of their total assets. From the statistics, however, it is difficult to ascertain if the overall levels of trade credit increased in the crisis period.

Table 4.5 Trade credit received across industry sector

Industry sector	NACE 2007	2003	2004	2005	2006	2007	2008	2009	2010	2011
Agriculture, forestry, fishing	11 (1110-1159)	0.08	0.08	0.08	0.09	0.09	0.09	0.08	0.09	0.09
Mining, Quarrying and Oil and Gas Extraction	21 (2111-2139)	0.09	0.08	0.09	0.10	0.09	0.10	0.10	0.15	0.12
Construction	23 (- 2389)	0.15	0.15	0.16	0.17	0.17	0.17	0.16	0.16	0.17
Manufacturing	31-33	0.14	0.14	0.14	0.16	0.16	0.15	0.14	0.15	0.14
Wholesale trade	41, 42	0.20	0.19	0.20	0.22	0.22	0.21	0.20	0.20	0.20
Retail trade	44-45	0.18	0.17	0.18	0.20	0.20	0.19	0.19	0.19	0.19
Transportation and warehousing	48-49	0.12	0.12	0.13	0.14	0.14	0.17	0.15	0.14	0.14
Information and Cultural industries	51	0.21	0.19	0.56	0.19	0.21	0.21	0.24	0.24	0.21
Real estate and rental and leasing	53	0.07	0.07	0.09	0.22	0.21	0.20	0.21	0.29	0.36
Professional, Scientific and Technical services	54	0.10	0.10	0.11	0.14	0.14	0.12	0.12	0.12	0.11
Management of company and enterprises	55	0.12	0.10	0.09	0.28	0.75	2.81	0.09	0.11	0.10
Administrative and support, Waste management and remediation service	56	0.12	0.16	0.12	0.15	0.30	0.15	0.15	0.30	0.30
Educational services	61	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Health care and social assistance	62	0.06	0.06	0.10	0.12	0.12	0.15	0.10	0.09	0.09
Arts, Entertainment and Recreation	71	0.17	0.09	0.15	0.26	0.28	0.24	0.23	0.22	0.25
Accommodation and Food services	72	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.11
Other services except public administration (beauty salons, repair shops	81	0.12	0.21	0.14	0.15	0.13	0.13	0.13	0.13	0.14
Average		0.12	0.12	0.15	0.16	0.20	0.31	0.15	0.16	0.16

* Wholesale, information and cultural industries, management and Arts and recreation have the largest TC to assets ratios

* Trade credit is measured by the ratio of accounts payable over total assets

Tables 4.1 – 4.5 reports the firm level data used in this study. Table 4.5 shows that trade credit as measured by accounts payable/assets has increased up to 2008 and 2009 and falls thereafter, but on average is still higher than the years 2003-2005. In Table 4.6 and Figure 4.1, the analyses concentrate on macro level data over the time period 2003 -2012. While this is a 15 country study most countries are common members of the Euro currency and monetary union with the exception of Sweden and the United Kingdom, who retain individual control over monetary policy and setting of interest rates. While monetary and fiscal policy has a significant impact on the performance of the SME sector, institutional factors also have a significant influence on the level and availability of finance to SMEs. Table 4.6 illustrates some of the main country level differentials across the sample of European SMEs.

Table 4.6 Average macroeconomic and institutional indicators across sample of European countries

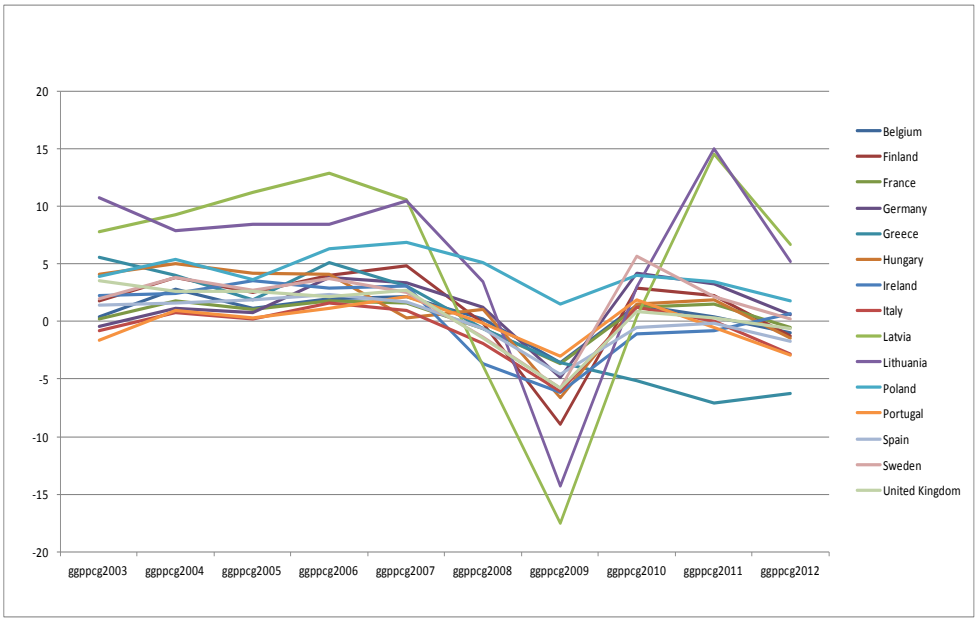
Table: Average macroeconomic indicators across European Countries 2003-2012

Country	Legal origin	Average GDPpcG		Average PcreditGDP		Average SME interest		Banking Concentration		Av. Est. Regulation quality		Av. Political stability		Composite Risk Rating
Belgium	French origin	0.59	(-1.09)	83.3	(-0.03)	3.83	(0.31)	84.66	(0.74)	1.33	(0.10)	72.7	(-0.94)	76
Finland	Scandinavian origin	1.18	(-1.72)	79.1	(-0.09)	3.78	(0.75)	97.41	(-0.330	1.75	(-0.52)	98.7	(-1.00)	80.75
France	French origin	0.44	(-1.48)	100.0	(-0.01)	3.75	(0.83)	62.14	(-0.68)	1.22	(-0.48)	61.9	(-1.09)	72.5
Germany	German origin	1.32	(-1.14)	109.7	(-0.11)	4.50	(0.56)	73.77	(0.72)	1.53	(-0.47)	73	(0.13)	84
Greece	French origin	-0.28	(-0.18)	86.4	(-0.02)	5.90	(-0.09)	0.23	(-0.37)	0.79	(-0.72)	53.1	(-0.28)	64.75
Hungary	Socialist	1.41	(-1.20)	50.5	(-0.12)	10.67	(1.17)	69.87	(1.80)	1.11	(-0.33)	73.4	(0.69)	68
Ireland	English	0.32	(-0.85)	179.0	(-0.28)	4.86	(0.93)	75.19	(1.12)	1.68	(0.67)	87.2	(-0.54)	72
Italy	French origin	-0.68	(-1.25)	98.0	(-0.3)	4.36	(0.42)	55.53	(0.27)	0.92	(-0.61)	60.9	(-0.69)	70.75
Latvia	Socialist	5.19	(-1.37)	61.0	(-0.14)	8.63	(0.98)	54.11	(-0.48)	0.99	(-0.34)	66	(0.24)	65.75
Lithuania	Socialist	5.84	(-1.68)	38.0	(0.11)	6.43	(0.79)	74.31	(-0.22)	0.95	(-2.31)	71.6	(1.72)	73.25
Poland	Socialist	4.21	(-0.08)	94.9	(0.18)	6.84	(1.06)	55.63	(0.59)	0.85	(0.08)	70.3	(-0.34)	75
Portugal	French origin	-0.18	(-0.41)	163.6	(-0.08)	6.52	(-0.10)	86.27	(0.02)	1.01	(-0.50)	77.2	(1.22)	68
Spain	French origin	0.14	(-1.02)	151.7	(0.23)	4.52	(0.61)	75.60	(1.05)	1.19	(-0.78)	39.9	(0.24)	67
Sweden	Scandinavian origin	1.56	(-1.17)	137.5	(.0.69)	3.94	(-0.01)	94.50	(0.07)	1.66	(0.43)	92.4	(-0.18)	85.5
United Kingdom	English	0.71	(-1.28)	173.8	(0.02)	5.21	(-0.11)	54.04	(-1.48)	1.71	(0.24)	57	(-0.01)	73.75

**Figures in parenthesis represent skewness of the variables over the sample period 2003-2012

** Composite Risk Rating is a rating for each country for the year 2012. The rating is a combination of Economic, Political and Financial Risks obtained from ICRG Data availabe from https://epub.prsgroup.com/icrg-tables

Figure 4.1 GDP per capita growth across sample of European countries: 2002-2013



Over the period 2003-2012, average GDP per capita growth was highest in the less developed regions of Latvia, Lithuania and Poland, while averages were lowest in Portugal, Italy and Greece. These average growth figures are highly influenced by the severe recession experienced from the period 2008 onwards. As illustrated in Figure 4.1, the two countries of Latvia and Lithuania experienced some of the highest levels of growth in GDP per capita, while also

experiencing the most severe falls in GDP per capita growth over the recession. Similarly, countries of Ireland, Italy, Spain and the UK experienced significant and dramatic reductions in GDP per capita at the onset of the financial crisis. While policies in terms of dealing with the crisis and levels of austerity differed across regions, the onset of the financial crisis dealt a significant blow to the prosperity and fortunes of the SME sectors across the European community. Most significantly, this can be seen in terms of demand and investment across Europe, but also in terms of the levels of bank credit extended economy wide. Column 2 of Table 4.6 shows the average levels of private sector credit extended by the banking sector across European countries over the period. Interestingly, these figures are negatively skewed reflecting the dramatic fall over the period 2008 onwards. The countries of Ireland, Portugal, Spain and the UK are noticeable outliers with average percentages of credit extended exceeding 150 percent of GDP. This compares to levels of 100 percent and below in countries of France, Belgium, Lithuania among others. These figures correlate with countries that experienced significant expansions in banking credit extended to the private sector up to the 2008, followed by dramatic falls in economic output and banking crises and public finance crises.

The average levels of interest rates charged to SMEs differ across regions over the period, while so too does the level of banking concentration. Some recent studies including Ryan et al. (2012) have found a direct correlation between the levels of banking concentration, interest rates charged to SMEs and access to finance. Since the crisis began, many European economies have experienced a severe reduction in the levels of banking concentration and competition. The countries of Belgium, Finland, Germany, Ireland, Sweden and UK rank high in

terms of regulation quality relative to the other sampled countries, only Sweden, UK, Ireland and Belgium have positively skewed figures for the whole sample period. Similarly, while many countries rank highly in terms of political stability for the period as a whole, the negative skewed figures (represented by those in parentheses) indicates the deterioration in political stability in many countries over the economic crisis. Finally, the variable Composite Risk Rating is a composite measure of the combined ranking of a country based on economic, political and financial risk factors obtained from the ICRG data[38]. All these figures are captured in the regression analysis and discussed in the results section of this chapter.

4.6 The results

Table 4.7 illustrates the relationship between firms' financial position at the time of the crisis and their subsequent use of trade credit finance in during the crisis/post-crisis years. The results reported are consistent with the findings in Chapter 3. The results show that firms in a stronger financial position when entering the crisis, in particular, those with the largest cash reserves, were net providers of credit in the subsequent years. They consistently extended more credit and received less than were the case prior to the onset of the financial crisis supporting H2a. This result holds when controlling for firm characteristics, country variables and firm fixed effects, and country fixed effects. The results hold for the levels of credit received measured by the variable "Tradecreditors", the levels of credit extended measured by the variable "Tradedebtors" and the net level of credit extended measured by the variable

[38] Note the variable is 'Composite Risk Rating' is a time invariant measure, calculated based on each country's ranking in the year 2012.

"Net TC". The variable "Net TC" is also important here as for the first time in this study, controlling for both firm individual effects, country level factors and time invariant unobservable factors, one can observe that firms with the largest levels of cash reserves entering the period of financial crisis were net providers of credit throughout the crisis period.

Table 4.7 Trade credit and firm cash levels across European financial crisis

The dependent variables are 'Tradecreditors' calculated as accounts payable scaled by firm input material costs and 'Tradedebtors' calculated as acounts recievable scaled by sales. 'Net TC' represents the net credit extended by firms calculated as the difference between trade recieveables minus payables scaled by firm sales. Independent variables include 'Crisis' represents a year dummy variable for the year of financial crisis impact in Ireland(2008), while 'Post1', 'Post2' , and 'Post3' are time dummy variables for the years 2009, 2010 and 2011 respectively.

Cashta-1*Crisis represents the SME level of cash to assets ratio one year prior to the crisis year. The interactions with 'Cashta-1' show the effects of 'Cashta-1' during the crisis and the three years following the onset of the crisis. The models are estimated with fixed effects and include the independent variables of 'Size' represented by the naturaal logarithm of firm assets, and lag measure of sales growth 'salesgrowth' and the age of the firm 'Age^2' and a measure for the level of shorterm bank debt and overdrafts outstanding scaled by firm assets.Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and 10% level.

	(1A) Tradecreditors	(1B) Tradecreditors	(2A) Tradedebtors	(2B) Tradedebtors	(3A) Net TC	(3B) Net TC	(3C) Net TC	(3D) Net TC	(3E) Net TC
Crisis	-.004	-.024***	-.0101***	0.011***	-.003***	-.004***	-0.001	-0.003*	-.003*
	(.01)	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post1	.010	-.006	.0055***	.005***	.011***	.010***	.004***	.003**	.003*
	(.01)	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post2	.011*	-.005	.0126***	.103***	.015***	.015***	.009***	.007***	.007***
	(.00)	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 3	.028***	.017**	.0145***	.0155***	.016***	.017***	.011**	.008***	.008***
	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Crisis*Cashta-1	.612***	.091***	.021***	.025***	.015***	.016***	.026**	.043***	.043***
	(.03)	(.03)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 1*Cashta-1	.133***	.051*	.004**	.006***	.001	.001	.023***	.039***	.039***
	(.00)	(.03)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 2*Cashta-1	.079**	.010	.006***	.008***	.004**	.004**	.031***	.050***	.050***
	(.03)	(.03)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Post 3*Cashta-1	-.001	-.080*	.009***	.011***	.006***	.006***	.034***	.051***	.051***
	(.03)	(.03)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
lag Size		-.0001***		-.001****		-.001**	.0001*	.0001***	.0001
		(.13)		(.00)		(.00)	(.00)	(.00)	(.00)
lag salesgrowth		-.0001		-.001		-.001	-.007***	-.009***	-.009***
		(.00)		(.00)		(.00)	(.00)	(.00)	(.00)
lag of Loansta							-.011**	-.033***	-.033***
							(.00)	(.00)	(.00)
Age^2		-0.0001**		-.0001**		-.003**	-.0001	-.001**	-.001*
		(.00)		(.00)		(.00)	(.00)	(.00)	(.00)
Firm Fixed Effects	YES	YES	YES	YES	YES	YES	YES	NO	NO
Country Fixed effects	No	No	No	No	No	No	No	YES	No
Country dummy	No	No	No	No	No	No	No	No	YES
Constant	.791***	.876***	.196***	.213***	.106***	.113***	.048***	.047**	.023***
	(.00)	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Observations	1579260	1183937	1676093	1353985	1671548	1351580	134521	134521	134521
number of groups	198358	194219	216961	214851	216785	214609	32965	8	32965
obs per group(average	8.0	6.1	7.7	6.3	7.7	6.3	4.2		4.2
Adjusted R-squared	.70	.75	.69	.73	.69	.72	.65	.03	.04

* Industry sector dummies makes no difference to results as they are excluded automatically with firm fixed effects

The adjusted R-squared for each of the regressions is in excess of 70 percent, indicating that the choice of variables included in the regression specification explain the majority of variation in each of the three dependent variables. In the final columns of the table, a measure of short-term bank debt is included to control for possible debt overhang among SMEs and their use of trade credit.

The inclusion of this variable reduces the sample size, nevertheless the negative sign coefficient is interesting in so far as indicating that SMEs with greater dependence on short-term bank debt extend less net credit in comparison to firms with lower ratios of short-term bank debt outstanding to total assets.

Table 4.8 reports results that examine the relation between trade credit and bank credit. The results show that the level of trade credit extended relative to bank finance received rises for the firms with the highest levels of cash reserves over the years of the crisis 2008 to 2011, controlling for country and firm level individual effects and time invariant unobservable factors, indicating support for H2 and H3. This result reinforces the finding that irrespective of changes in the banking sector, firm's role as financial intermediaries increased over the crisis period, and this role is particularly noticeable for firms with the strongest financial position when entering the crisis.

Table 4.8 Trade credit and bank credit

The dependent variables are 'Net TC/ Bank Finance' calculated as the difference trade receivables minus payables scaled by the total outstand bank debt of the firm . 'Net TC' represents the net credit extended by firms calculated as the difference between trade recieveables minus payables scaled by firm sales. Independent variables include 'Crisis' represents a year dummy variable for the year of financial crisis impact in Ireland(2008), while 'Post1', 'Post2' , and 'Post3' are time dummy variables for the years 2009, 2010 and 2011 respectively.

Cashta-1*Crisis represents the SME level of cash to assets ratio one year prior to the crisis year. The interactions with 'Cashta-1' show the effects of 'Cashta-1' during the crisis and the three years following the onset of the crisis. The models are estimated with fixed effects and include the independent variables of 'Size' represented by the naturaal logarithm of firm assets, and lag measure of sales growth 'salesgrowth' and the age of the firm 'Age^2'.Standard errors are represented in

	(1) Net TC/ Bank finance	(1A) Net TC/ Bank finance
Crisis	.029***	-.002
	(.00)	(.00)
Post1	.050***	.007***
	(.00)	(.00)
Post2	.065***	.010***
	(.00)	(.00)
Post 3	.073***	.003
	(.00)	(.00)
Crisis*Cashta-1		.028***
		(.00)
Post 1*Cashta-1		.043***
		(.00)
Post 2*Cashta-1		.073***
		(.00)
Post 3*Cashta-1		.091***
		(.00)
lag Size		.000***
		(.00)
lag salesgrowth		.001
		(.00)
Age		.009***
		(.00)
Country dummies		YES
Fixed Effects	YES	YES
Constant	.207***	.031***
	(.00)	(.00)
Observations	1,440,166	945,250
number of groups	204,822	156,305
Adjusted R-squared	.66	.71

* Industry sector dummies makes no difference to results as they are excluded automatically with fixed effects

Country effects

To analyse the influence of country specific factors on the levels of trade credit extended and received within the SME sector, see Table 4.9.

Table 4.9 Trade credit and institutional country level factors

The dependent variables are 'Net TC' represents the net credit extended by firms calculated as the difference between trade recieveables minus payables scaled by firm sales. Independent variables include variables of 'Size' represented by the natural logarithm of firm assets, a measure of cash stocks of the firm scaled by sales (Cashsa) and lag measure of sales growth 'salesgrowth' and the age of the firm 'Age^{2}' and interaction variable of cash reserves by firm size (Cashsa*totalwinsor) and a measure for the level of shorterm bank debt and overdrafts outstanding scaled by firm assets (loansta).

Variables capturing country level factors include Banking concentration, GDP per capita growth, Political stability, Regulatory quality, and 'PcreditGDP' which capitures the level of credit extended by a country's banking sector as a proportion of GDP. The final variable is interest rate which captures the interest rate charged on loans of less than €1m across the set of European countries.
Our final set of variables are dummy variables according to the LLVS of country level origin.
Standard errors are represented in parentheses, while the ***, **, *, represent coefficients significant at the 1%, 5% and 10% level.

	Net TC (1)	Net TC (2)	Net TC(3)	Net TC (4)	Net TC (5)	Net TC (6)
Size	0.0001	.004***	.003***	-0.0001	.00001***	-.0001**
	(.00)	(.00)	(.00	(.00)	(.00)	(.00)
lag salesgrowth	-0.0001	-0.011**	-.008***	-.0128***	-.010***	-.011***
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Lag Cashsa	.001***	.102***	.105***	.0001	.001***	.001*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Age	-.001***	.00001*	.001**	.002**	-.0001**	.001**
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Age2	.0001***	-.0001*	-.001*	-.0001**	-.0001*	-.0001**
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Cashsa*Firm size	0.0001*	-.0001*	-.0001	.00001*	.0001**	.0001**
	(.00)	(.00)	(.00	(.00)	(.00)	(.00)
Lag of Loansta		-.007	.009*			
		(.00)	(.00)			
Industry dummies	YES	YES	YES	YES	YES	YES
Country dummies	NO	NO	NO	YES	NO	NO
Banking concentration					.003***	.001**
					(.00	(.00)
GDPpc Growth					.001***	-.0001
					(.00)	(.00)
ICRG Political stability					-.004**	.0001**
					(.00)	(.00)
ICRG Regulatory quality					-.083***	-.034***
					(.00)	(.00)
ICRG Current Composite Risk*			-.003***			
			(.00)			
lag of PcreditGDP					.0002***	.0001***
					(.00)	(.00)
lag of SME interest rate					.005***	.006***
					(.00)	(.00)
English origin	Base	Base	Base	Base	Base	Base
French origin	.122**	.121***				
	(.00)	(.00)				
Scandinavian origin	-.009**	-				
	(.00)					
German origin	-.010***	-.027***				
	(.00)	(.00)				
Socialist	-.012***	-.006***				
	(.00)	(.00)				
Fixed Effects	NO	NO	NO	YES	NO	YES
Year dummies	YES	YES	YEAR	YES	No	YES
Constant	.012***	.014**	.267***	.088***	.244***	.067***
	(.00)	(.00)	(.00)	(.00)	(.03)	(.00)
Observations	1345439	143888	143888	1345439	1179183	1179183
number of groups	226757	40065	40065	226757	221001	221002
Adjusted R-squared	.15	.08	.08	.73	.21	.74

* Industry sector dummies makes no difference to results as they are excluded automatically with fixed effects
* Regressions include robust standard errors and include country observations weights
* This varaible, unlike ICRG Political stability and ICRG Regulatory Quality is time invariant and represents the country ranking for one year

In Table 4.9, the relationship between the use of trade credit financing over the financial crisis and role of country level institutional factors is analysed. In column one, grouped country level dummies are included, similar to those used in La Porta et al.(1998) to examine the relationship between country institutional factors and SME finance. Given the statistically significant coefficients, country and institutional factors are clearly important rejecting the null hypothesis H4. More debateable are whether H4 and H5 is supported by these results. From the first two columns, the results show that levels of net credit extended are greater in French origin countries (i.e., Belgium, France, Italy, Portugal, Greece and Spain) over common law countries, while Scandinavian, German and Socialist origin countries show lower levels of net credit in comparison to common law countries. The results in columns 1 and 2 indicate that the relation between net trade credit and country legal origin are lower in all three legal origins of Scandinavian, German and Socialist when compared to the common law countries of Ireland and the UK, with French origin being the only region to have a positive coefficient.

In column 3, composite country risk rating are included. While this variable is time invariant, its negative coefficient surprisingly indicates that an inverse relation between the levels of trade credit extended net economy wide and the level of composite risk. This result could indicate a negative impact of overall country level risk and level of credit and transmission mechanism of bank credit discussed in chapter 3. In columns 5 and 6, one can see that factors of banking concentration, GDP growth, the level of private sector credit issued by the

banking sector are all positively associated with the level of net credit extended economy wide, while an inverse relationship between regulatory quality, political stability and net trade credit is observed. Interestingly, controlling for firm level fixed effects; increased levels of banking concentration are associated with higher levels of trade credit use, perhaps indicating a movement towards informal sources of firm level finance, when of level of competition in the banking sector are reduced. Additionally regulatory quality, political stability are all associated with lower levels of trade credit use.

Firm Survival throughout the crisis

Finally, while the results above do reaffirm some of the predictions about institutional and regulatory requirements influence on SME finance, they say little about the likely impact of trade credit finance on SME survival. This is a topic that has been neglected within the literature. While many studies have examined the relationship between SME access to finance and credit constraints which influence SME performance and ultimately survival, there has been little in the way of research into the role of trade credit on SMEs survival.

In this chapter, the factors influencing SME survival throughout the crisis period in this European sample are also analysed. Some studies have found evidence that the survival of firms is contingent on the firms' ability to develop its own individual competencies to adapt to the highly competitive and changing business environment (Esteve-Pérez and Manez-Castillejo 2008). Some studies focus on firm survival from entry stage (Geroski, 1995) with firm age, human capital and managerial experience as important determinants of SME survival (Cressy 2006). It is also noted that 50% of start-ups disappear within the first five years (Berger and Udell 1998). Financial development also reduces the

costs of external finance to firms. In terms of trade credit, the majority of studies have tended to focus on the role of trade credit and its influence in easing financial distress for SMEs, as is the case in this study. Suppliers can support their customers through trade credit financing when they experience a temporary liquidity shocks (Cunat, 2007). The issue of debt overhang is also particularly important in the case of SMEs and their probability of default (Lawless and McCann 2013). This leads my next two hypotheses

H6 SMEs with a larger level of debt overhang are more likely to default

H7 Access to trade credit finance is unrelated to the probability survival among SMEs over the crisis

Out of the 15 countries in my sample, some countries (but not all) have information on failed firms. Therefore to estimate the influence of trade credit on survivorship, I limit the sample to the countries in which data on surviving firms is available. These include the countries of Belgium, Finland, France, Germany, Hungary, Ireland, Italy, Portugal, Spain, Sweden and the United Kingdom. The countries of Greece, Latvia, Lithuania and Poland do not have information on insolvency.

While it can be argued that this study of SME finance primarily focuses on surviving SMEs throughout the crisis, I do have information on almost three and half thousand failed firms over the sample period. The largest majority of these are in the countries of France, Portugal, Spain and the United Kingdom, with information on over 1,000 failed SMEs in Spain, 841 in France, 681 in Portugal and 336 in the United Kingdom. While there are likely to be a greater number more SMEs that have become insolvent, dormant over the intervening period, the data reliably shows us that these numbers at a minimum have experienced

severe financial pressures that have forced them to exit the industry. Table 4.10 shows a breakdown of the numbers of failed firms in the sample.

Table 4.10 Firm survival across sample

Table: Proportion of insolvent/failed firms in sample

	# Firms	# insolvent/failed firms	% of sample failed/insolvent
Belgium	7765	17	0.22
Finland	12232	44	0.36
Frannce	37673	841	2.23
Germany	4712	43	0.91
Hungary	9390	9	0.10
Ireland	8277	7	0.08
Italy	12342	98	0.79
Potugal	26157	681	2.60
Spain	51951	1044	2.01
Sweden	47975	232	0.48
United Kingdom	29728	336	1.13
	248202	3352	1.35

In Table 4.11, a simple Probit model was estimated to assess the likely influence of the factors the institutional factors and trade credit on SME survival[39]. Probit model estimation is a non-linear transformation of the linear probability model also known as Ordinary Least Squares (OLS). The transformation of combination Xβ is constrained to an outcome of a [0,1] interval. Under the normal distribution of a continuous dependent variable, however for a binary dependent variable the outcome is bounded between a [0,1] interval. Therefore for a binary dependent variable y and a (k x 1) vector of explanatory variables, the conditional probability is specified by the following

$$Prob(y = 1|x) = G(x, \beta) = X'\beta$$

[39] Unfortunately, given the data available to me, it is not possible to accurate date when the firm failed, however, all firm failures occurred within the sample time period, and majority occurred during the crisis years of 2008-2012.

In the case of a binary dependent variable, traditional OLS estimation contains the assumption of homoscedastic and constant variance of the error term, this assumption is automatically violated in the case of a binary dependent variable. The distribution of the error term in the case of a binary dependent variable is non-normal and only contains two possible outcomes. An individual error (εi) is conditional on xi, therefore, only two possible outcomes. Either $\varepsilon_i = 1 - x'\beta$ with probability $x'\beta$ (the probability of observed value 1) and $\varepsilon_i = -x'\beta$ with probability $1 - x'\beta$ (the probability of the observed value = 0).

Additionally, with only two possible outcomes, the variances of the error terms depend on x and are heteroscedastic.

$$Var(\varepsilon_i|X_i) = (x'\beta)(1 - x'\beta\ )$$

Using standard linear probability estimation in the case of a binary dependent variable will lead to inefficient estimates, biased errors and ultimately mis-leading inferences. With Probit estimation the model is transformed to constrain the outcome to the [0,1], therefore in the case of the regression conducted here, where the dependent variable is whether the SME fails or not, the specification is as follows

$$Prob(y = 1|x) = G(x, \beta) = \ G(X'\beta)$$

Here G is the standard normal cumulative distribution where $G(x_i, \beta) = \phi(x_i'\beta)$ where ϕ represents the conditional expectation. Since Probit transforms the functions of $(x'\beta)$ are non-linear, Probit estimation requires Maximum likelihood estimation which gives the parameters most likely to generate the data.

In addition, with Probit estimation, we must be careful with the interpretation of the coefficients.

$$\text{Probit}: \frac{\partial\, Prob(y_i=1|x_i)}{\partial x_{ij}} = \phi(x_i'\beta)\beta_j$$

Therefore the marginal effect, i.e. what happens to the dependent variable y_i when we increase the explanatory variable. The marginal effects are the conditional probability of a unit increase in the jth explanatory variable. The regression for determining survival is there as follows.

Equation 12 SME survival

$$Y_{it} = \times_{it} \beta + \varepsilon_{it} \text{ where } \varepsilon_{it\sim} (0, \sigma^2)$$

The dependent variable is whether or not the firm became insolvent/bankrupt. The dependent variable is modelled as binary choice where $Y_{it} = 1$ if the event occurs and 0 if not to firm i at time t and X is a vector of explanatory variables influencing survival including firm age, size, growth and access to trade credit finance. As regards survivorship, the results indicate the following, intuitively; SMEs in regions and in periods of higher economic growth are less likely to fail. Firms that are older and larger in size are statistically less like to become insolvent, however those with higher debt levels and variability in sales are particularly at risk.

Table 4.11 Trade credit use and firm survival

Probit model of Firm failure

Dependent variable = (1= firm failed, 0 if the firm survived).
Independent variables capture individual firm characteristics, such as firm size, growth, age, industry sector, the level of trade credt received relative to bank credit(Tradebankcredit), country and industry controls.
' Net days represents the ldifference of credit days minus debtor days to capture levels of credit received in terms of days as measure of net credit received. 'Net receieved' captured the level of trade credit received calculated as (accounts payable- receievable scaled by sales).
Lag represnts the one year lag of the varaible.

	Reg 1		Reg 2		Reg3	
Varable	Coefficient	SE	Coefficient	SE	Coefficient	SE
Employees	-0.002	0	0.0001	0	-.001*	(.00)
lag.Loansta	0.312	(.27)	-.001**	(.00)	-.034*	(.00)
lag Cashta	-1.276***	(.33)	-.012**	(.00)	-1.088*	(.03)
lag Firm sales growth	-.087	(.09)	-.076**	(.00)	-.079**	(.01)
Age	.000**	(.01)	-0.001	(.00)	-.001**	(.00)
Tradebankcredit	-.0171***	(.03)				
Net days			-.001**	(.00)		
Net receieved					-.207***	(.02)
Year dummies	YES		YES	YES	YES	
Industry dummies	YES		YES	YES	YES	
Country dummy	NO		YES	YES	YES	
Banking concentration	.068***	(.00)				
GDP per capita	-.071**	(.03)				
Observations	731971		826834		603785	
Pseudo R-squared	0.16		0.06		0.05	

***, **, * represent statistical significance at the 1%,5% and 10% level.

Averge Marginal effects of Trade credit received

	dy/dx	SE
Net received	-0.006***	(.00)

Interestingly for the sample, the results do show that firms that receive more trade credit are significantly more likely to survive the crisis period than those with the same indebtedness that did not trade credit. This is further reflected by the statically significant negative coefficient for the variable banking concentration. The higher the degree of banking concentration, the greater the chance SMEs will experience obtaining bank finance, particularly in periods of financial distress, ultimately influencing SME survival.

It is also worth noting in measuring the goodness of fit of the Probit model, I note the Pseudo R-square which differs from the regular R-square used

throughout this research. The Pseudo R-square captures the goodness of fit is measured as

$$1 - \frac{Lur}{L0}$$

Where Lur refers to the log likelihood for function for the full model and L0 represents th log likelihood function for the model with only an intercept.

4.6 Conclusions

Using a large sample of 300,000 European SMEs, this study highlights the role of trade credit as an important source of finance for financially vulnerable SMEs over the financial crisis. While this chapter draws upon a large heterogeneous sample of SMEs across the Euro area, the chapter represents a significant advancement in the knowledge regarding the financing of SMEs over the financial crisis period and the role of institutional country risk factors. The combination of firm level data and country level indicators demonstrates the significant relationship between individual country specific factors and individual SME financing behaviour. The findings of this study would indicate that while country and institutional differences are important determinants of the use of trade credit financing among SMEs over the crisis, the influence of country level factors are interconnected with influence of firm level characteristics, particularly in the case of unlisted SMEs, which is the focus of this chapter.

Specifically, this study demonstrates the important role of peer to peer financing within the SME sector. The increased levels of financing extended by cash rich SMEs over the crisis years played a significant role in financing financially

vulnerable SMEs for a period of time and ultimately, and most likely influencing their survival in many cases. The observed differences in both the number of debtor days across countries, sectors and years is also interesting. Banking concentration, the level of credit extended by the banking sector and the rate of interest rates charged on lending to SMEs is undoubtedly connected to the level of trade credit within the SME sector. SMEs are more likely to rely on trade credit financing if they are (a) experiencing difficulty in accessing bank financing for working capital purposes and (b) if the cost of bank finance as determined by the interest rate on short term loans is greater. Country specific factors including political stability and regulatory quality are both inversely related to the level of trade credit used among SMEs when holding all other factors constant. This is further reflected by the differences in results between legal origins, which are likely to influence both regulatory rules as regards creditor payment days and creditor rights.

Chapter 5 Discussion and Conclusions

5.1. Discussion of the research

This thesis aims to examine the impact of the financial crisis on the financing behaviour of SMEs. In addition the research aims to demonstrate the impact of the reduction in the availability of bank credit as a result of the financial crisis on SMEs. In chapter 2, the Pecking Order theory is tested as the conventional predictor of SME financing decisions by; (a) employing a novel test of the Pecking Order not previously applied to SMEs and (b) using a panel data sample examining the changes in SME financing behaviour over the trade cycle and incorporating the financial crisis. The study outlined in Chapter 2 highlighted the growing levels of financial deleveraging among Irish and UK SMEs over the financial crisis, while also highlighting the increased role of trade credit finance and working capital management among SMEs. While it questions the suitability of traditional capital structure theories in explaining SME finance behaviour, it also highlights that in large firm studies a mixture of debt and equity are the primary sources of external finance, whereas in SMEs the choice is primarily between short-term debt finance and trade credit.

In Chapter 3, the extent of trade credit use among SMEs is empirically tested and its role as a source of finance to SMEs is measured. The important role of this source of finance, although, highlighted in the literature has not been tested for SMEs based on their financial position entering the financial crisis. This chapter tests whether trade credit is a substitute for bank lending in times of financial crisis and whether financially stronger firms extend credit to

financially weaker firms over the financial crisis. While in Chapter 4, the research is extended to a European context where institutional, economic and financial factors and their impact on SME finance decisions are examined.

The research highlights the differences in responses to the crisis internationally in terms of policy. While this research has not attempted to evaluate such policy schemes, there are a number of policy recommendations for SMEs that are worth consideration.

5.2 Contributions of the research

This thesis began with the primary aim of examining the applicability of existing capital structure theories in explaining SME financing decisions over the business cycle and financial crisis. This requires a comprehensive test of SME capital structure and working capital theory. From the existing literature it was evident that a) the Pecking Order theory had emerged as the primary descriptor of SME capital structure and finance decisions from both a theory (Stanworth and Gray, 1991; Chittenden et al., 1996; Berger and Udell, 1998) and empirical perspective (Chittenden et al., 1996; Jordan et al., 1998; Berggren et al., 2000; Watson and Wilson., 2002; Mac an Bhaird and Lucey, 2010 and Vanacker and Manigart, 2010). The research began by questioning both of these conventional wisdoms, particularly in the context of a financial crisis, whereby access to bank finance is severely restricted and increased pressure is placed on the availability of internal finances and cash flow. The second fact observed from the literature within the field was the similarities in empirical strategies applied to test the applicability of the Pecking Order theory or otherwise. Within the literature, the empirical approach generally applied was based on leverage

regressions, reliant on correlations among variables as empirical evidence in support of theory. As pointed out by Leary and Roberts (2010) and Streubulaev (2007) the predications of various leverage regressions often have no power to distinguish between alternative theories. Myers (2001) concluded that empirically, it is possible to argue support for any of the capital structure theories due to contextual and the empirical approach applied, not to mention misspecification of findings in the absence of accounting for fixed effects (Flannery and Rangan, 2006). With the exception of emerging theories for SME financial lifecycle (Berger and Udell, 1998; Gregory et al, 2005, and Mac an Bhaird and Lucey, 2011) and theory specifically focused on high growth firms and start-ups (Vanacker and Manigart, 2010; Hogan and Hutson, 2005), the Pecking Order to this day remains the default theory of SME finance.

This thesis challenges the Pecking Order theory and its strength as the default theory for SMEs by contributing to the literature in the field in terms of methodology, applying a flow of funds methodology for a sample of Irish and UK SMEs with panel data analysis. In addition, given its importance to SMEs, the methodology accounted for debt capacity, which hadn't previously been accounted for within existing SME capital studies. While the predictions of the Pecking Order regarding firm profits, age, size tangibility and non-debt tax shields were all supported by the empirical evidence of this research, the findings obtained also suggested that alternative financing sources had increased in importance for SMEs over the crisis period, particularly trade credit. In the absence of the methodological approach applied in Chapter 2, this result may not have been apparent.

The findings obtained in Chapter 2 suggest that theoretical models ought to pay greater attention to the working capital of SMEs as opposed to the traditional theories and empirical strategy in SME finance literature to date which focused on the trade-off of debt versus equity and longer term finance decisions of SMEs. In addition, the findings obtained from the study conducted in Chapter 2 were further supported by upcoming and new research in the SME finance field which focused more on short-term finance decisions of SMEs and working capital management. As highlight in Table 1.1 of Chapter 1 (illustrated below), a growing number of studies within SME finance began to examine the role of working capital and short-term financing decisions among SMEs.

Existing panel studies using balance sheet firm level data on the working capital of SMEs

Paper	Database	Countries	Time Period	No. of SMEs
McGuinness(2015)	Amadeus	15 European Countries	2004-2012	283,360
Carbo-Valverde et al. (2012)	Amadeus	Spain	2004-2008	3,404
Psillaki and Daskalikis(2009)	Amadeus	Four western countries	1997-2001	11,654
Martínez- Sola et al. (2013)	SABI database(BVD) of Spanish SMEs	Spain	2000-2007	11,337
Banos-Cabellero, García- Tereul and Martínez-Solano (2012)	SABI database(BVD) of Spanish SMEs	Spain	2002-2007	1008 Spanish SMEs
Casey and O'Toole (2014)	SAFE Data	11 Western countries	2009-2011	3,500

One of the first studies to do this using actual firm level accounting data was Carbo-Valverde et al (2012) who empirically examined the role of trade credit finance in SME investment decisions. The paper found that trade credit played

an important role in the investment among credit constrained SMEs who were constrained in terms of access to bank finance. Likewise Petersen and Rajan (1997) and Berger and Udell (1998) highlighted the important role, yet under researched topic of trade credit within the SME finance field of literature. Research including Banos-Cabellero et al. (2013); Martínez- Sola et al. (2013) and Psillaki and Daskalikis (2009) are among some of the new wave of studies which examine the working capital and trade credit use among SMEs. Among these, Vermoesen et al. (2013) examined the investment among a sample of Belgium SMEs over the crisis and found that investment was significantly hindered by the difficulty of SMEs to renew their loans due to a negative banking credit supply shock. With the exception of (Carbo-Valverde et al, 2012; Vermoesen et al., 2013 and Casey and O'Toole, 2014), the majority of existent studies that examined financing behaviour since the financial crisis were based on listed firms from emerging market economies, such as (Bastos and Pindado, 2013 and Love et al., 2007) and not unlisted SMEs whom by their nature are more restricted in the sources of finance available to them (Petersen and Rajan, 1997; Berger and Udell, 1998; Cowling et al, 2012; Beck et al, 2008 and Bernanke, 1983). While there are a number of reasons why the contextual setting of these studies are important and likely to impact on findings such research, as the differences between firm size and country of residence.

This thesis is the first study that has examined the role of trade credit throughout a period of financial crisis across the Euro area using direct firm level accounting data, of which is comparable across regions.

In Chapter 3, the research contributes to the empirical knowledge and evidence on trade credit use by testing for redistribution and substitution effects in the

SME sector. The results show support for redistribution but also indicate some evidence of substitutability between bank finance for trade credit supporting the earlier predictions of Petersen and Rajan(1997) and Fishman and Love (2003).

Previous research has outlined that trade credit contract terms depend upon many factors including length of time in which the firm and other firms do business (Rodriguez-Rodriguez, 2006; Fishman and Love, 2003), the industry setting, and the ability of firms to monitor, reinforce payments and cut off future supplies (Love and Zaida, 2010). Research has also highlighted the many costs (Wilson and Summers, 2002) and benefits for firms in using trade credit (Schwartz,1977) such as avoiding bankruptcy and ability to negotiate more favourable and flexible payment schedules with suppliers instead of banks (Huyghaebaert et al., 2007) and the ability to reduce overall borrowing costs (Fabbri and Klapper, 2009; Giannetti et al, 2011). Based on a sample of 1008 Spanish SMEs over the period 2002-2007, Banos-Cabellero et al, (2012) demonstrated how trade credit finance could sustain and maximise profitability by balancing costs and benefits and using an optimal working capital strategy.

Empirically however, little research has examined the theories of Redistribution and Substitution between trade credit and bank finance over the crisis period. The Redistribution concept, originally by Meltzer (1960) and later developed by Calomiris et al. (1995) argues that liquid firms could provide a cushion of support to financially constrained firms during periods of credit tightening (Bias and Gollier, 1997; Berger and Udell, 1998; Guarglia and Mateut, 2006), however, to the best of my knowledge this has not previously been tested in the case of SMEs using actual firm level accounting data.

Likewise, there is support for the Substitution of trade credit and bank credit in the literature (Bias and Gollier, 1997; Burkart and Ellingson, 2004 and Cunat, 2007), however evidence among European SMEs over the crisis remains absent. In addition, another line of literature on financing since the crisis also points to evidence of a propagation of liquidity shocks. Boissay and Gropp (2007); Kiyotaki and Moore (1997) and Love and Zaida (2010) all predict a propagation of liquidity shocks within inter firm financing in the aftermath of a financial crisis. While the results of this thesis do show a reduction in overall levels of net credit, at the same time they indicate an enhanced role of trade credit for financially vulnerable SMEs over the crisis period. The study also controls for country effects in Chapter 4, which are likely to influence any potential substitutability between trade and bank credit (Demirguc Kunt and Maksimovic, 2001; Hernández-Cánovas and Koeter-Kant, 2011).

This research contributes to existing literature in terms of its methodology and contextual setting. The findings obtained from Chapter 3 are of interest to SMEs policy makers and practitioners. Methodology wise, the use and combination of interactive dummy variables with firm fixed effects enables us to capture the level of extension and receipt of credit by SMEs over the period based on their financial position and this is new. Furthermore, the inclusion of a net credit variable allows for this. Overall results demonstrate the importance of financial position of firms measured by short-term dependence on bank finance, sales, profitability, and cash resources available to the firm, including bank deposits, collateral and strength of cash flow. Results show that SMEs most vulnerable to the crisis, i.e. those with the highest short-term debt ratios extended significantly less credit thereafter, while receiving more in the form of trade credit. Results

obtained from Chapter 3 and 4 illustrate that older and larger firms appear to be net providers of credit, having extended more and received less over the crisis supporting the predictions of Berger and Udell (1998). While controlling for firm age, growth, size and industry sector, firms with the greatest levels of cash reserves are net providers of credit and provide significantly more credit to their business partners relative to pre-crisis periods. The study also includes a measure for the extension and receipt of in terms of quantity of credit based on accounts receivable and payables and the number of debtor and creditor days. Results obtained from Chapter 3 demonstrate changes in net number of days of credit as well as the quantity of credit, and a measure of the working capital requirement in terms of the length of days between firms' receipt of payment and payment outlays. The results, highlighted in Chapter 3 however, do show cause for concern in the case of some micro firms being placed under strain in terms of repayments over the crisis. On average, however, financially stronger firms extended credit between 12 – 46 percent longer in terms of days over the crisis period. While this could be derived from an unwillingness to repay among customers, it could also be the allowance of financial flexibility in terms of repayments to constrained business partners with whom they expect to continue to do business.

The inclusion and examination in relation to asset intangibility and receipt of trade credit was included in Chapter 3. This measure is quite important for SMEs, particularly those with whom would be most financially constrained due lack of collateral for their protection of their creditor (Berger and Udell, 1998; Michaelas et al, 1999). Interestingly, results indicate that many of these received

significantly more credit in the form of inter firm financing, however we would suspect that this could be involuntary.

The findings of Chapter 3 are further confirmed for a cross country European sample in Chapter 4. Chapter 4 not only illustrates the importance of macroeconomic and institutional factors in determining the outcomes for SMEs in terms of finance, but the financial vulnerability of firms entering the crisis was the most important determinant in outcomes for SMEs. The application of a large database and the use of robust panel data methodology in a European context is a significant contribution to the research field in Chapter 4. While a growing number of studies have analysed the importance of institutional and country level factors in influencing SME financing behaviour (Beck et al. 2003; Psillaki and Daskalakis, 2009 and Joeveer, 2013) and the differences between listed and unlisted (Brav, 2009; Joeveer, 2013). This study is the first to examine the impact of the financial crisis on working capital among European SMEs using actual firm level financial data. Country effects hitherto have remained outside the remit of SME analysis due to data restrictions. Could it be that trade credit and relationship lending could mitigate country level institutional factors through on-going business information sharing? (Fishman and Love, 2003).

Previous studies have found that institutional accounting standards and disclosure requirements vary significantly across regions (Petersen and Rajan, 1994; Demirguc-Kunt and Maksimovic, 2008), as well as the availability and cost of access to finance for SMEs (Bass and Schrooten, 2002; Berger and Udell, 1998). One of the aims of this research was to examine the relative importance of firm characteristics versus country specific and institutional

factors in determining the use of trade credit financing over the crisis. A recent study on SME debt finds that country specific factors are greater indicator of leverage for unlisted firms (Joeveer, 2013), and higher shareholder and creditor protection rights are associated with higher levels of leverage. As stated, the findings of this thesis demonstrate that net credit extension over the crisis period among the firms with the strongest financial position. They also show that net credit extension is highest in the common law countries of Ireland and the UK out of the sample of 15 countries. Despite the belief that trade credit use is associated with regions of lower financial development and likely to be more important across regions where creditor protection is weaker (Burkart and Ellingson, 2004).

Research on European institutional and macroeconomic factors over the financial crisis period reveals that bank loan credit terms in periphery countries of Ireland, Greece, Italy, Spain and Portugal deteriorated significantly since the crisis. Increased bank market power is associated with lower levels of investment due to restricted loan supply, conditions and lending rates (Ryan et al., 2014). Differences in capital buffers and banking sectors across regions were highlighted (De Bruychere et al., 2013), while Revest and Spio (2012) differentiated finance systems across Europe into banking based (German, France and Swedish) and market based systems such as the UK and predicted that countries in bank based regions should display greater reliance on networks and relationships with creditors. These factors are undoubtedly important in terms of finance availability within the SME sector across Europe.

To take account of institutional differences in creditor rights and legal obligations of SMEs across regions, this study includes a variable to capture the

effect of regulatory quality and the rule of law and enforcement as well as a composite measure of economic, political and financial country level risk. Among the many findings, the results indicate that Common and French Civil law countries of Ireland, UK, Belgium, France, Italy, Spain and Portugal all exhibited higher levels of net credit extension over German, Scandinavian and Socialist origin countries. A negative relation between levels of net credit extension economy wide and composite risk index measure was found, most likely indicating an overall negative impact of overall country level risk and level of credit and the transmission mechanism. Banking concentration, GDP growth and credit issued by banks are all found to be positively associated with the levels of inter-firm financing in the SME sector, while regulatory quality and political stability is observed to be inversely related to trade credit use when holding all other economic, financial and firm level observable and unobservable factors constant.

Finally, SME survival was determined and influenced over the crisis by both the level of debt overhang among SMEs and SMEs access to trade credit when bank finance is restricted. This is a further contribution to the literature as no previous study has examined the relationship between SME survival and trade credit use over crisis.

5. 2.1 Key contributions

In sum, this research represents a significant advancement in the knowledge and literature on SME finance and behaviour in times of crisis.

1. Empirically, this is the first study to examine working capital behaviour of SMEs in the aftermath of the 2008 financial crisis using comprehensive

panel data. From a data point of view a contribution is evident in sample size and time period as well as the number of observations.

2. It is also the first to empirically demonstrate and quantify the redistribution effect in the case of SMEs over the financial crisis based on actual firm level accounting data. Significantly, the redistribution came about not from the increased ability to raise debt as indicated in large firm studies previously (Calomiris et al., 1995) but from cash reserves.
3. The research demonstrated that the financial position is key in determining trade credit use.
4. The inclusion of country, institutional and macroeconomic variables with firm level financial data is also an important empirical extension to SME panel data studies.
5. In addition, the research is the first to demonstrate the relation between trade credit use and the probability of survival. SME survival was determined and influenced over the crisis by both the level of debt overhang among SMEs and SMEs access to trade credit when bank finance is restricted.

More generally, this research posits a new approach to the analysis of SME financing based on measures of working capital and cash availability to replace the traditional debt/equity ratios. Thus it seeks to change the way we view and examine SME finance. The official statistics that show that levels of debt and equity financing are low reflects the prevalence of working capital rather than investment based financial decision making practices in SMEs. Thus a cash based indicator, such as net cash proves a more useful and relevant indicator of the firm's financial position, as opposed to traditional measures of capital structure based on debt to equity ratios.

5.3 Limitations of the research and avenues for further research

Despite the scope and contributions of the research, avenues for future research exist. It is important to include market power analysis, while from a policy perspective, there is much talk of credit guarantee schemes (CGS). Emerging evidence indicates a shift away from bank finance by the level of borrower discouragement. Nevertheless, a movement in policy towards a focus on encouraging inter-firm finance has also been ignored in literature until relatively recently (Martínez- Sola et al., 2013).

As highlighted in each chapter of this thesis, there are significant additions to SME finance research, most notably with the benefit of a significant panel of SMEs. The benefits of this have been highlighted in Chapter 3 and 4. However, the research also points out certain limitations of this research and avenues for further research which is significantly warranted in this growing and important research field.

To summarise, the limitations of this research are

a) This research primarily focused on mature SMEs, many of which were of an average of 10 years of age. Given the diversity of SMEs and the dynamic nature of the sector, further research into the role of working capital and trade credit among young SMEs would be a valuable extension to this research.
b) While survivorship is not the sole focus of this study, it would be interesting to examine survivorship in greater detail in future research, particularly how finance decisions and availability of finance impact on survivorship and investment among SMEs. Given these important

limitations, an extension of research would be helpful and would add to our knowledge in this field.

c) As stated in the introduction, a major benefit in this study is the use of panel data analysis. This research focused on mainly static panel data models, however with the inclusion of lagged values of variables. An extension of this methodology, particularly in the study of the use of trade credit would be dynamic panel data. Dynamic panel data estimation is particularly relevant given the habitual nature of trade credit use. i.e. a firm's decision to use trade credit use is a function of their use of trade credit financing in past years. In dynamic panels, past values of the dependent variable are included as explanatory variables in the model. This introduces measurement error such as autocorrelation rendering estimation biased and inconsistent. Therefore a particular type of estimation procedure is required. With dynamic panel data, it is necessary to take account of potential autocorrelation between previous levels of the dependent variable.

The inclusion of GMM improves consistency. OLS is inconsistent since the change in previous values of the dependent variable and changes in the error term are correlated. In dynamic panels, the problem is that traditional OLS estimator is inconsistent as $(Y_{i,t-1} - Y_{i,t-2})$ is correlated with $(\varepsilon_{it} - \varepsilon_{i,t-1})$

Arrellano and Bond GMM estimator makes use of the orthogonality conditions to produce more efficient estimate, based on lagged values of instrumental variables. The Arrellano and Bond System GMM estimator is suitable for the data.

$$Y_{it} = \propto + \delta Y_{it-1} + X'\beta + \mu_i + V_{it}$$

The lag of the dependent variable will be correlated with the error term. Even if X is mean independent with μ_i, lag of the dependent variable will be pre-determined. So even if E $(\mu_i/X_i) = 0 \; \forall it$; Cov $(Y_{it-1}, \mu_i) \neq 0 \; \forall it$, therefore OLS estimator is biased and inconsistent.

The inclusion of the Arrellano and Bond System estimator is worth considering as trade credit is a habitual source of finance used by firms. Therefore, as robustness check, a dynamic model was estimated for one country (Italy due to data coverage) and yielded similar results to those obtained in Chapter 3 and 4 of this thesis, confirming that the results obtained for trade credit are consistent with other estimation methods. Nevertheless, as an extension to this research, a dynamic panel model across a sample of European countries would be an addition to the literature on SME finance.

5.3 Policy implications

The policy implications of this research are important.

1) Improve knowledge regarding credit worthiness, thereby reducing asymmetric information

   a) SME credit ratings could be useful in this regard. This could help reduce the reliance of banks on asset backed and collateral based lending.

   b) Improve the requirements for SME financial data disclosure.

   c) Focus on combining both demand and supply side financing information. This objective is also highlighted by the OECD (2013).

2) The research conducted in this thesis points to significant peer to peer lending within the SME sector. As a result, it is important that policy, particularly in the area of enterprise and job creation, should focus on peer to peer lending and utilise industry peer to peer lending information. This could improve the effectiveness in the SME lending process and reduce the incidents of credit rationing. Access to export finance and invoice discounting schemes would be a useful addition, particularly in the Irish context.

3) Improve access to external credit markets in the economy and this finance obtained can be channelled to SMEs through the financial intermediation process.

4) As we observe from the findings in Chapter 2, aversion to external equity finance is a major issue in the SME sector. Improving knowledge and access to equity finance for SMEs would be important for future growth and prosperity.

5.3.1 Policies introduced in Ireland over the crisis

In Ireland, since the start of the crisis a number of policy initiatives have been introduced. A targeted credit guarantee scheme was introduced in 2012 which provided a 75 percent State guarantee to banks against losses on loans to commercially viable firms with potential for job creation. The scheme was aimed at facilitating additional lending of between €10,000 to €1 million to SMEs that have been refused bank credit for either of two reasons, (a) insufficient collateral and/ or (b) perceived as higher risk under current risk

evaluation practices. The scheme charged a 2 percent annual premium which partially covers the scheme[40].

In addition to the CGS introduced in Ireland, The Strategic Banking Corporation (SBCI) is the latest initiative to facilitate the access to credit for commercially viable SMEs into the future and an independent Credit Review Office as well as a number of other schemes such as The Employment and Investment Incentive Scheme (EIIS) and the 'Code of Conduct on Prompt Payments', which is part of the government's Action Plan for Jobs. This code is aimed to help promote and encourage best practice among businesses and improve the payment culture. It is worth noting that many of these policies initiatives have focused on the supply side of finance to SMEs.

5.4 Conclusions

This research examines the impact of the financial crisis on the financing decisions and behaviour of SMEs. The research illustrates the important role of inter firm financing within SMEs and the impact of the banking crisis on financing behaviour. The study introduces a new direction for the study of SME finance based on short-term financing and working capital behaviour. It is the first study to empirically demonstrate and quantify the redistribution effect in the case of SMEs. SME survival was determined and influenced over the crisis by both the level of debt overhang among SMEs and access to trade credit. Empirically, this research demonstrates the effectiveness of panel data analysis using commercially available databases in a cross country SME context and sets the standard for data driven empirical research in the field going forward.

[40] http://www.sfa.ie/Sectors/SFA/SFA.nsf/vPages/Advice~Financial_Management~launch-of-the-credit-guarantee-scheme-20-11-2012?OpenDocument

References

Agostino, M., Gagliardi,F. and Trivieri, F. (2012). Bank competition, lending relationships and firm default risk: An investigation of Italian SMEs. *International Small Business Journal*, 30, 907- 943.

Aktas, N., de Bodt, E., Lobez, F. and Statnik, J. (2012). The Information Content of Trade Credit. *Journal of Banking and Finance*, 36, 1402-1413.

Armour, J. and Cumming, D. (2008). Bankruptcy law and entrepreneurship. *American Law and Economics Review*, 10, 303-350.

Askildsen, J.E., Baltagi, B. H. and Holmas, T. H. (2003). Wage policy in the health care sector: a panel data analysis of nurses' labour supply. *Health Economics*, 12, 705-719.

Audretsch, D. B. and Mahmood, T. (1995). New firm survival: new results using a hazard function. *The Review of Economics and Statistics*, 77, 97-103.

Ayyagari, M., Beck, T. and Demirguc-Kunt, A. (2007). Small and Medium Enterprises across the Globe. *Small Business Economics*, 29, 415-434.

Baltagi, B. H. (2008). Econometric Analysis of Panel Data. Chichester, England: John Wiley and Sons, 4th edition.

Banos-Caballero, S., Garcia-Tereul, P.J., and Martinez-Solano,P.(2012). How does working capital management affect the profitability of Spanish SMEs? *Small Business Economics*, 39, 517-529.

Barclay, M. J., C. W. Smith and Morellec, E. (2006), 'On the Debt Capacity of Growth Options', *Journal of Business*, 79, 37-59.

Barrell, R., Fie, T., Fitz Gerald, J., Orazgani, A. and Whitworth, R., 2011. The banking sector and recovery in the EU economy. National Institute Economic Review 216 (1), R41–R52. [Accessed 5.01.2012]

Bartholdy, J., C. Mateus, and Olson, D. (2012). Do Portuguese private firms follow pecking order financing? *The European Journal of Finance*, 1-19.

Bartoli, F., Ferri, G., Murro, P., and Rontondi, Z. (2013). Bank-firm relations and the role of Mutual Guarantee Institutions at the peak of the crisis. *Journal of Financial Stability*, 9, 90-104.

Bass, T. and Schrooten, M. (2006). 'Relationship banking and SMEs: A Theoretical Analysis', *Small Business Economics*, 27, 2,127-137.

Bastos, R. and Pindado, J. (2013). Trade credit during a financial crisis: A panel data analysis. *Journal of Business Research*, 66, 614-620.

Brav, 0. (2009). Access to Capital, Capital Structure and the Funding of the Firm. *The Journal of Finance*, 64, 263-308.

Beck, T., A. Demirgüç-Kunt and Maksimovic, V. (2008). 'Financing Patterns around the World: Are Small Firms Different?' *Journal of Financial Economics*, 89, 467-487.

Beck, T., Demirg¨u¸c-Kunt, A. and Maksimovic, V. (2004). Bank competition and access to finance: international evidence. Proceedings, 627–654.

Beck, T., Demirgüç-Kunt, A. and Maksimovic, V. (2008). 'Financing Patterns around the World: Are Small Firms Different?' *Journal of Financial Economics*, 89, 467-487.

Berger, A,N. and Udell, G.F. (1998), 'The Economics of Small Business Finance, the role of Private Equity and Debt Markets in the Financial Growth Cycle', *Journal of Banking and Finance,* 22, 613-673.

Berger, A.N. and Udell, G.F. (2006), 'A More Complete Conceptual Framework for SME finance', *Journal of Banking Finance,* 30, 2945- 2966.

Berggren, B., C.Olofsson and Silver, L. (2000). 'Control Aversion and the Search for External Financing in Swedish SMEs', *Small Business Economics,* 15, 233-242.

Bernanke, B. (1983). Non-Monetary effects of the Financial Crisis in the Propagation of the great Depression, National Bureau of Economic Research, Working Paper 1054.

Bharaith, S., P. Pasquariello and Wu, G. (2009). 'Does Asymmetric Information drive Capital Structure Decisions?' *Review of Financial Studies,* 22, 311-324.

Biais, B. and Gollier, C. (1997). Trade Credit and Credit Rationing. *Review of Financial Studies,* 10, 903-937.

BIS (2012) 'SME Access to External Finance' BIS Economics Paper No. 16.

Bolton Committee Report (1971), Report of the Committee of inquiry on small firms. Cmnd. 4811, London: HMSO.

http://www.bis.gov.uk/assets/BISCore/enterprise/docs/S/12-539-sme-access-external-finance.pdf

Boissay, F. and Gropp, R. (2007). Trade Credit Defaults and Liquidity Provision by Firms. ECB Working Paper No. 753.

Bradley, M., G.A. Jarrell and Han Kim, E. (1984).'On the existence of optimal capital structure: theory and evidence', *Journal of Finance*, 39, 857-878.

De Bruychere, V., Gerhardt, M., Schepens, G. and Vander Vennet, R. (2013). Bank/sovereign spillovers in the European debt crisis, *Journal of Banking and Finance*, 37, 4793-4809.

Burkart, M. and Ellingsen, T. (2004). In-Kind Finance: A Theory of Trade Credit. The *American Economic Review*, 94, 569-590.

Calomiris, C., Himmelberg, C.P. and Wachtel., P. (1995). Commercial Paper, corporate Finance and the Business Cycle, A microeconomic perspective. *Carnegie- Rochester Conference Series on Public Policy*, 42, 230-250.

Caneghem, T. and Campenhout, G.(2012). 'Quantity and Quality of Information and SME Financial Structure'. Small Business Economics, Forthcoming.

Carbo-Valverde, S., Rodriguez-Fernandez, F. and Udell, G.F. (2009). Bank market power and SME financing constraints. *Review of Finance*, 13, 309–340.

Carpenter, R. and Peterson, B. (2002). 'Is the Growth of Small Firms Constrained by Internal Finance?' *The Review of Economics and Statistics*, 84, 193-204.

Casey, E. and O'Toole, C.M. (2014). Bank-Lending constraints, trade credit and alternative financing during the financial crisis: Evidence from European SMEs. *Journal of Corporate Finance*, 27, 173-193.

Central Bank of Ireland. (2001). Quarterly financial accounts for Ireland, Quarter 3, Dublin.

Central Bank of Ireland. (2011). Central bank quarterly bulletin, Quarter 4. Central Bank of Ireland, Dublin.[Accessed 4.10.2012]

Central Bank of Ireland. (2013). The impact of the Financial Crisis on Banks' Net Interest Margins, No.1. Available from:

http://www.centralbank.ie/publications/Documents/130328%20-%20New%20Research%20on%20the%20Impact%20of%20the%20Financial%20Crisis%20on%20Banks%E2%80%99%20Net%20Interest%20Margins.pdf. [Accessed 25September 2013].

Central Bank of Ireland. (2012). SMEs in Ireland: Stylised facts from the real economy and credit market. Available from:

http://www.centralbank.ie/publications/Documents/SMEs%20in%20Ireland%20Stylised%20facts%20from%20the%20real%20economy%20and%20credit%20market.pdf. Accessed 25 September 2013.

Central Statistics Office Ireland. (2011). Access to Finance 2007 and 2010. Available from:

http://www.centralbank.ie/stability/Documents/SME%20Conference/Session%202/paper.pdf. [Accessed 25 September 2013].

Centre for Business Research University Cambridge. (2009). SME finance and innovation in the current economic crisis. University of Cambridge, Cambridge, UK. Available from: http://www.cbr.cam.ac.uk/pdf/CrCr_EconCrisis.pdf. [Accessed 20. August 2014].

Chirinko, R. and Singha, A. (2000). 'Testing Static Tradeoff against Pecking Order Models of Capital Structure: A Critical Comment', *Journal of Financial Economics*, 58, 417-425.

Chittenden, F., Hall, G. and Hutchinson, P. (1996). 'Small Firm Growth, Access to Capital Markets and Financial Structure: Review of Issues and Empirical Investigation', *Small Business Economics*, 8, 59-77.

Choi, W.G. and Kim, Y. (2005). Trade Credit and the effect of Macro financial shocks: Evidence from US Panel data. *Journal of Financial and Quantitative Analysis,* 40, 897-925.

Cosh, A. and Hughes, A. (1994). Size, financial structure and profitability: UK companies in the 1980s. In: Hughes, A. and Storey, D. J. (eds.) *Finance and the small firm.* London: Routledge.

Cotei, C. and Farhat, J. (2009). 'The Trade-Off Theory and the Pecking Order Theory: Are they Mutually Exclusive', *North American Journal of Finance and Banking Research,* 3, 1-16.

Coulibaly, B., Sapriza, H. and Zlate, A. (2013) Financial frictions, trade credit and the 2008-2009 global financial crisis. *International Review of Economics and Finance*, 26, 25-38.

Cowling, M., Weixi, L. and Ledger, A. (2012). Small business financing in the UK before and during the current financial crisis. *International Small Business Journal,* 30, 778-800.

Cressy, R. and Olofsson, C. (1997). 'The financial conditions for Swedish SMEs: Survey and research agenda, *Small Business Economics*, 9, 179-195.

Cressy, R. (2006).Why Do Most Firms Die Young?, *Small Business Economics,* 26, 103–116.

Cull, R., Soledad, M. and Pería, M. (2013). Bank ownership and lending patterns during the 2008–2009 financial crisis: Evidence from Latin America and Eastern Europe. *Journal of Banking and Finance*, 37, 4861-4878.

Cumming, D. and Dai, N. (2010). Local bias in venture capital investments. *Journal Empirical Finance*. 17, 362–380.

Cunat, V. (2007). Trade credit: Suppliers as debt collectors and insurance providers. *The Review of Financial Studies*, 20, 491-527.

Danielson, M.G. and Scott, J.A. (2007). 'A note on Agency Conflicts and the Small Firm Investment Decision', *Journal of Small Business Management*, 45, 157-175.

De Jong, A., Kabir, R. and Nguyen, T.T. (2008). Capital Structure around the world; The roles of firm and country-specific determinants. *Journal of Banking and Finance*, 32, 1955-1969.

Demirguc-Kunt, A. and Maksimovic,V.(2001). Firms as Financial Intermediaries: Evidence from Trade Credit Data. *World Bank Policy Research Working Paper,* No. 2696.

Djankov, S., McLiesh, C. and Shleifer, A. (2007). Private credit in 129 countries. *Journal of Financial Economics*, 84, 299-329.

Donaldson, G. (1961). 'Corporate Debt Capacity: A study of Corporate Debt Policy and the determination of Corporate Debt Capacity, Boston, Division of Research, Harvard Graduate School of Business Administration.

Drakos, K. (2013). Bank loan terms and conditions for Eurozone SMEs. *Small Business Economics,* 41, 717-732.

EIM Business and Policy Research Report. (2012). Do SMEs create more and better jobs? A report published by the European Commission. Available from: http://ec.europa.eu/enterprise/policies/sme/facts-analysis/performance-review/files/supporting-documents/2012/do-smes-create-more-jobs_en.pdf. [Accessed 08.12.2014].

Emery, G., W. (1984). A Pure Financial Explanation for Trade Credit. *Journal of Financial and Quantitative Analysis*, 19, 271-285.

Emery, G., W. (1987). An Optimal Financial Response to Variable Demand. *Journal of Financial and Quantitative Analysis*, 22, 209-225.

Ennew, C.T. and Binks, M.R. (1997). 'Information Asymmetries, The banking relationship and the implications for Growth', *In: Frontiers of Entrepreneurship Research*. Babson College, Wellesley, Mass.

Esteve-Pérez, J. and Manez-Castillejo, J. (2008). The resource-based theory of the firm and firm survival. *Small Business Economics*, 30, 231–49.

European Commission. (2013). A Recovery on the Horizon? Annual Report on European SMEs 2012/2013. Available from: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2013/annual-report-smes-2013_en.pdf. [Accessed 10.12.2014]

European Commission. (2008). Communication from the commission to the council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: "Think Small First" A "Small Business Act" for Europe.

European Commission. (2013). 2013 SME's Access to Finance survey, Analytical report. Available from: http://ec.europa.eu/enterprise/policies/finance/files/2013-safe-analytical-report_en.pdf. [Accessed: 24.11.2014].

European Central Bank. (2014). Banking Structures Report: October 2014. Available from: https://www.ecb.europa.eu/pub/pdf/other/bankingstructuresreport201410.en.pdf [Accessed 05.11.2014]

European Central Bank. (2011). Survey on the access to finance of SMEs in the Euro area: September 2010 to February 2011. Available from: http://www.ecb.int/stats/money/surveys/sme/html [Accessed 21.02.2012]

Fabbri, D. and Klapper, L.F. (2008). Market Power and Matching of Trade Credit Terms. World Bank Policy Research Working Paper No. (4754).

Fama, E,F. and French, F.(2002). 'Testing Trade-off and Pecking Order theories about Dividends and Debt', *The Review of Financial Studies*, 15, 1-33.

Fama, E,F. and French, K. (2005). 'Financing Decisions: Who issues stock?' *Journal of Financial Economics*, 76, 549-582.

Fazzari, S., Hubbard, R. G. and Petersen, B. C. (1988). Financing constraints and corporate investment. *NBER Working Papers* 2387, National Bureau of Economic Research.

Ferrando, A. and Mulier, K. (2013) Firms' financial constraints: do perceptions match the actual situation? ECB Working Paper. Available from: http://www.eea-esem.com/files/papers/eea-esem/2012/429/financial_constraints_FerrandoEEA.pdf.[Accessed: 20.08.2014]

Ferris, J. S. (1981). A Transactions theory of trade credit use. *Quarterly Journal of Economics*, 94, 243-270.

Fischer, K.H. (2000). Acquisition of information in loan markets and bank market power - an empirical investigation (EFA 0593).

Fishman, R. and Love, I. (2003). Trade Credit, Financial intermediary development and industry growth. *Journal of Finance*, 58, 353-374.

Flannery, M. and Rangan, K. (2006), 'Partial Adjustment towards Target Capital Structures', *Journal of Financial Economics*, 79, 469-506.

Forfás. (2013). A Review of the Equity Landscape in Ireland. Available from : http://www.forfas.ie/media/310113-Review_of_the_Equity_Investment_Landscape_in_Ireland-Publication.pdf [Accessed 24.09.2014]

Frank, M. Z. and Goyal, V.K. (2003). 'Testing the Pecking Order Theory of Capital Structure', *Journal of Financial Economics*, 67, 217-248.

Frank, M. Z. and Goyal, V.K. (2009). Capital Structure Decisions: Which Factors are Reliably Important?, *Financial Management*, 38, 1-37.

Fredriksson, A and Moro, A. (2014). Bank-SME relationships and banks' risk adjusted profitability. *Journal of Banking and Finance*, 41, 67-77.

Garcia-Appendini, E. and Montoriol-Garrig, J. (2013). Firms as liquidity providers: Evidence from the 2007-2008 financial crisis. *Journal of Financial Economics*, 109, 272-291.

García-Tereul, PJ. and Martínez-Solano, P. (2010). A dynamic perspective on the determinants of accounts payable. *Review of Quantitative Finance and Accounting*, 34, 439-457.

Ge, Y. and Qiu, J. (2007). Financial development, bank discrimination and trade credit. *Journal of Banking and Finance,* 31, 513-530.

Geroski, P. (1995). What Do We Know about Entry?, *International Journal of Industrial Organization*, 13, 421–440.

Gertler, M. and Gilchrist, S. (1993).The role of credit market imperfections in the monetary transmission mechanism: Arguments and Evidence. *Scandinavian Journal of Economics*, 95, 43-64.

Gertler, M. and Gilchrist, S. (1994), ' Monetary Policy, Business cycles and the behaviour of Small Manufacturing firms', *Quarterly Journal of Economics*, 109, 309-340.

Giannetti, M., Burkart, M. and Ellingsen, T. (2011). What you sell is what you lend? Explaining trade credit contracts. *Review of Financial Studies*, 24, 1261-1298.

González, V. M. and González, F. (2014). Banking liberalization and firms' debt structure: International evidence. *International Review of Economics and Finance*, 29, 466-482.

Graham, J. R., and Harvey, C. R. (2001). The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics*, 61, 187-243.

Gregory, B.T., Rutherford, M.W., Oswald, S. and Gardiner, L. (2005). 'An empirical investigation of the growth cycle theory of small firm financing', *Journal of Small Business Management*, 43, 382-92.

Guariglia, A. and Mateut, S. (2006). Credit channel, trade credit channel, and inventory investment: Evidence from a Panel of UK firms. *Journal of Banking and Finance*, 30, 2835-2856.

Hall, G., P. Hutchinson and Michaelas, N. (2000). ‘ Industry Effects on the determinants of Unquoted SMEs’ Capital Structure’, *International Journal of the Economics of Business*, 7, 297-312.

Halov, N. and Heider, F. (2004). ‘Capital Structure, Risk and Asymmetric Information, Working paper, New York University.

Hanedar, E.Y., Broccardo, E. and Bazzana, F. (2014). Collateral requirements of SMEs: The evidence from less-developed countries, *Journal of Banking and Finance*, 38, 106-121.

Heaton, J.B.B. (2002), ‘Managerial Optimism and Corporate Finance’, *Financial Management*. 31, 33-45.

Hernández-Cánovas, G. and Koeter-Kant, J. (2011). SME Financing in Europe: Cross- Country determinants of bank loan maturity. *International Small Business Journal*, 29, 489-507.

Hogan, T. and Hutson, E. (2005), ‘Capital Structure in new Technology-Based Firms: Evidence from the Irish Software Sector’, *Journal of Global Finance*, 15, 369-387.

Holmes, S. and Zimmer, I. (1994), ‘The Nature of the Small Firm: Understanding the motivations of Growth and Non Growth oriented Owners’, *Australian Journal of Management*, 19, 97-120.

http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0394:FIN:EN:PDF. [Accessed 30 November 2013].

http://www.scotland.gov.uk/Topics/Statistics/18389/Scotland [Accessed: 13.04.2012]

Huang, R. and Ritter, J.R. (2009). 'Testing theories of Capital Structure and estimating the speed of Adjustment', *Journal of Financial and Quantitative Analysis*, 44, 237-271.

Hubbard, G. R. (1998). 'Capital market imperfections and Investment', *Journal of Economic Literature*, 36, 193-225.

Hubbard, R. G. (1998). Capital-market imperfections and investment. *Journal of Economic Literature*, 36, 193–225.

Huyghebaert, N. (2006). On the Determinants and Dynamics of Trade Credit Use: Empirical evidence from Business Start-ups. *Journal of Business, Finance and Accounting*, 33, 305-328.

IIF Bain report Restoring Finance and Growth to European SMEs. (2013). [Accessed 5.03. 2014]

Irish Small and Medium Size Enterprise Association. (2013). SME Credit Watch, January 2013. Available from: [http://isme.ie/index.html] Accessed 25 March 2013.

Ivashina, V. and Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial Economics* 97, 319–338.

Jensen, M.C. and Meckling, W.H. (1976). Theory of the firms: managerial behaviour, agency costs and ownership structure. *Journal of Financial Economics*, 3, 305-360.

Joeveer, K. (2013). 'What do we know about the capital structure of small firms?', *Small Business Economics*, 41, 479-501.

Johnson, G.J. and McMahon, R. (2005). 'Owner-manager gender, financial performance and business growth among SMEs from Australia's business longitudinal survey', *International Small Business Journal*, 23, 115-142.

Jordan, J., Lowe, J. and Taylor, P. (1998). Strategy and financial policy in UK small firms. *Journal of Business Finance and Accounting*, 25, 1–27.

Kaplan, S. N. and Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? The *Quarterly Journal of Economics*, 112, 169–215.

Korajczyk, R. A. and Levy, A. (2003). Capital Structure Choice: Macroeconomic Conditions and Financial Constraints, *Journal of Financial Economics*, 68, 75-109.

Kelly, J. and Everett, M. (2004). Financial liberalisation and Economic Growth in Ireland. Central Bank of Ireland Quarterly Bulletin. Autumn 2004.

Kinsella, R., Clarke, W.M., Storey, D.J., Mulvenna, D and Coyne, D. (1994). Fast-growth small firms: An Irish Perspective. Dublin. Irish Management Institute.

Kiyotaki, N. and Moore, J. (1997). Credit Chains, Edinburgh School of Economics, Discussion Paper.

Klapper, L., Laeven, L. and Rajan, R. (2012). Trade Credit Contracts. *The Review of Financial studies*, 25, 839-867.

Kohler, M., Britton, E. and Yates, T. (2000). Trade Credit and the Monetary Transmission Mechanism. Discussion Paper. Bank of England.

Kolasa, M., Rubaszek, M. and Taglioni, D. (2010). Firms in the great global recession: The role of foreign ownership and financial dependence. *Emerging Markets Review*, 1, 341–357.

Korajczyk, R.A. and Levy, A. (2003).'Capital Structure Choice: Macroeconomic Conditions and Financial Constraints', *Journal of financial Economics,* 68, 79-109.

Kraus, A. and Litzenberger, R.H. (1973). A State Preference Model of Optimal Financial Leverage. *The Journal of Finance,* 28, 911-922.

Lane, P. and McQuade, P. (2013). Growth and International Capital flows. *Scandinavian Journal of Economics,* 1, 218-252.

Leary, M. and Roberts, M. (2010). 'The Pecking Order, Debt Capacity, and Information Asymmetry', *Journal of Financial Economics,* 95, 332-355.

Leary, M. and Roberts, M. (2014). Do Peer Firms Affect Corporate Financial Policy? *Journal of Finance,* 69, 139-178.

Lee, S.H., Yamakawa, Y., Peng, M. and Barney, J.B. (2011). How do bankruptcy laws affect entrepreneurship development around the world? *Journal of Business Venturing,* 26, 505-520.

Lemmon, M. and Zender, J. (2010).'Debt capacity and tests of capital structure theories', *Journal of Financial and Quantitative Analysis,* 45, 1161-1187.

Long, M. S., Malitz, I.B. and Ravid, S. A.(1993). Trade Credit, Quality Guarantees, and Product Marketability. *Financial Management*, 22, 117-127.

Lopéz-Gracia, J. and Sogorb-Mira, F. (2008). 'Testing Trade-Off and Pecking Order Theories Financing SMEs', *Small Business Economics,* 31, 117-136.

Love, I. and Peria, M. S. M. (2012). How bank competition affects firms' access to finance, *The World Bank Policy Research Working Paper* (6163).

Love, I., and Zaidi, R. (2010). Trade Credit, Bank Credit and Financial Crisis. *International Review of Finance*, 10, 1, 125-147.

Love, I., Preve, L. and Sarria-Allende, V. (2007). Trade Credit and Bank Credit: Evidence from the Recent Financial Crises. *Journal of Financial Economics*, 83, 453–69.

Mac an Bhaird, C. and Lucey, B.(2011). 'An Empirical Investigation of the Financial Growth life Cycle', *Journal of Small Business and Enterprise Development*, 18, 715-731.

Mac an Bhaird, C. and Lucey, B. (2010). Determinants of Capital Structure in Irish SMEs. *Small Business Economics*, 35, 357-375.

Margaritis, D. and Psillaki, M. (2007). 'Capital Structure and Firm Efficiency', *Journal of Business Finance and Accounting*, 34, 1447-69.

Martinez- Solo, C. and Garcia-Tereul, P.J. (2013). Trade credit and SME profitability. *Small Business Economics,* DOI 10.1007/s11187-013-9491-y

Marotta, G. (2001). Is trade credit more expensive than bank loans? Evidence from Italian firm-level data. Working Paper. Universita` di Modena e Reggio Emilia.

Marotta, G. (2005).When do trade credit discounts matter? Evidence from Italian firm-level data. *Applied Economics*, 37, 403-416.

Mateus, C., Gama A. and Teixeira A. (2010). Does trade credit facilitate access to bank finance? An empirical evidence from Portuguese and Spanish SME's. *International Research Journal in Finance and Economics*, 45, 26-45.

Mateut, S., Bougheas, S. and Mizen, P. (2006). Trade credit, bank lending and monetary policy transmission. *European Economic Review,* 50, 603–629.

Mazars. (2011). SME Lending Demand Study: Prepared on behalf of the Department of Finance for the period April to September 2011.Available from: http://www.finance.gov.ie/documents/publications/reports/2011/mazarbanklend.pdf.[Accessed 30 November 2013].

Meltzer, A.(1960). Mercantile Credit, Monetary Policy and the Size of Firms. *Review of Economics and Statistics*, 42, 429-436.

Mian, S. L. and Smith, C. W. (1992). Accounts Receivable Management Policy: Theory and Evidence. *Journal of Finance,* 47, 169-200.

Michaelas, N., Chittenden, F. and Poutziouris, P. (1999). 'Financial Policy and Capital Structure Choice in U.K. SMEs: Empirical evidence from Company Panel Data', *Small Business Economics*, 12, 113-130.

Miller, M.H. (1977). Debt and Taxes. *The Journal of Finance,* 32, 261-275.

Menton, A. And Sherman, M. (2014). Analysis of the SME Market using Micro Data. *Central Bank of Ireland Working Paper*. Available at:

https://www.centralbank.ie/polstats/stats/Documents/Menton%20Paper.pdf [Accessed 28.09.2014].

Modigliani, F. and Miller, M.H. (1958). 'The Cost of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review*, 48, 261- 97.

Myers, S.C. (2001). 'Capital Structure', *Journal of Economic Perspectives*, 15, 81-102.

Myers, S.C. and Majluf, S.C. (1984). 'Corporate Financing and Investment Decisions when Firms have Information that Investors do not Have', *Journal of Financial Economics*, 13, 187-221.

Myers, S.C. (1984). Capital Structure Puzzle. *Journal of Finance,* 39, 575-592.

National Economic and Social Council (NESK) (1984). The role of the financial system in financing the traded sectors. Dublin: The Stationary Office.

Ng, C. K., Kilholm Smith, J. and Smith, R. L. (1999). Evidence on the determinants of credit terms used in inter firm trade. *Journal of Finance*, 49, 3-37.

Nilsen, J.H. (2002). Trade Credit and the Bank Lending Channel. *Journal of Money, Credit and Banking*, 34, 226-253.

OECD. (2006). The SME financing gap: Theory and evidence. OECD Journal: Financial Market Trends 11, 89-97.

OECD. (2013). Financing SMEs and Entrepreneurs 2013: An OECD Scoreboard. Available from: http://www.oecd.org/cfe/smes/Scoreboard_2013_extract_chapter2.pdf [Accessed 24.09.2014]

Ogawa, K., Sterken, E. and Tokutsu,I. (2013). The trade credit channel revisited: evidence from micro data from Japanese small firms. *Small Business Economics*, 40, 101-118.

Petersen, M. A. and Rajan, R. G.(1994). The benefits of lending relationships: Evidence from small business data. *Journal of Finance*, 49, 3-37.

Petersen, M. A. and Rajan, R.G. (1997). Trade Credit : Theories and Evidence. *The Review of Financial studies*, 10, 661-691.

Petersen, M. A. and Rajan, R. G. (1995). The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics,* 110, 407–43.

Petit, R. and Singer, R. (1985). 'Small Business Finance: A Research Agenda', *Financial Management*, 14, 47-60.

Poutziouris, P. Z. (2002). The financial affairs of smaller family companies. In: Fletcher, D. E. (eds.) *Understanding the small family business.* London: Routledge.

Psillaki, M. and Daskalakis, N. (2009). 'Are the Determinants of Capital Structure County or Firm Specific?', *Small Business Economics*, 33, 319-333.

Rajan, R. G. and Zingales, L. (1995). 'What do we know about Capital Structure? Some Evidence From International Data', *Journal of Finance*, 50, 1421-1460.

Ramey, V. (1992). Source of Fluctuations in Money: Evidence from Trade Credit. *Journal of Monetary Economics*, 30, 171-193.

Ratti, R. A., Lee, S. and Seol, Y. (2008). Bank concentration and financial constraints on firm-level investment in Europe. *Journal of Banking and Finance*, 32, 2684–2694.

Revest, V. and Sapio, A. (2012). Financing technology-based small firms in Europe: what do we know?, *Small Business Economics*, 39, 179-205.

Rodriquez-Rodriquez, O.M. (2006). Trade Credit in Small and Medium Sized Firms: An Application of the System Estimator with Panel Data*. *Small Business Economics*, 27, 103-126.

Ryan, R.M., O'Toole, C.M. and McCann, F. (2014). Does bank market power affect SME financing constraints?, *Journal of Banking and Finance,* 49, 495-505.

Schnabel, J. A. (1992). 'Small Business Capital Structure Choice', *Journal of Small Business Finance*, 2, 13-21.

Schwartz, R. A. (1974). An Economic Model of Trade Credit, *Journal of Financial and Quantitative Analysis*, 9, 643-657.

Shyam-Sunder, L. and Myers, N.S. (1999). 'Testing Static Trade-Off Against Pecking Order Models of Capital Structure', Journal *of Financial Economics*, 51, 219-244.

Smith, J. K. (1987). Trade Credit and Informational Asymmetry, *The Journal of Finance,* 4, 863-873.

Stanworth, J. and C. Gray, C. (Eds.).(1991). Bolton 20 years on: The small firm in the 1990s. Paul Chapman Publishing, London.

Strebulaev, I. (2007). Do Tests of Capital Structure Theory Mean What They Say?, *The Journal of Finance,* 62, 1747-1787.

Stiglitz, J.E. and Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review,* 71, 393-410.

Titman, S. and Wessels, R. (1988). The Determinants of Capital Structure Choice, *The Journal of Finance,* 43, 1-19.

Tsuruta, D. (2008). Bank information monopoly and trade credit: Do banks have information of small businesses? *Applied Economics*, 40, 981-996.

Vanacker, T. and Manigart, S. (2010). 'Pecking Order and Debt Capacity Considerations for High Growth Companies Seeking Finance', *Small Business Economics*, 35, 53–69.

Vanacker, T., Heughebaert, A. and Manigart, S. (2014). Institutional Frameworks, Venture Capital and the Financing of European New Technology-based Firms. *Corporate Governance: An International Review*, 22, 199-215.

Vermoesen,V., Deloof, M. and Laveren, E. (2013). Long-term debt maturity and financing constraints of SMEs during the Global Financial Crisis. *Small Business Economics*, 41, 433-448.

Walker, M. (1989). 'Agency Theory: A Falsification Perspective, *Accounting, Organisation and Society*, 14, 433-453.

Watson, R. and Wilson, N. (2002). Small and Medium Sized Enterprise Financing: A note on some of the Empirical Implications of a Pecking Order. *Journal of Business, Finance and Accounting*, 29, 557-578.

Whelan, K. (2013). Ireland's economic crisis: The good, the bad, and the ugly. *Journal of Macroeconomics*, 39, 424-440.

Wilner, B. S. (2000). The Exploration of relationships in financial distress: The case of trade credit. *Journal of Finance*, 55, 153- 178.

Wilson, N. and Summers, B. (2002). Trade credit terms offered by small firms: Survey evidence and empirical analysis. *Journal of Business, Finance and Accounting*, 29, 317-351.

Wu.W., Rui, O. M. and Wu, C.(2012). Trade Credit, cash holdings and financial deepening: Evidence from a transitional economy. *Journal of Banking and Finance*, 36, 2868-2883.

Appendix

Appendix A: From Chapter 2

A.1. Industry sector classification for Irish and UK SMEs

	Industry sectors	Number of SMEs	Proportion in Irish Sample	Proportion in Scottish sample
1	Agricultre, Fishing and Forestry	123	6	21
2	Mining Quarying and extraction	47	2	22
3	Food processing/ Manufacturing	1261	33	243
4	Copper metal production	35	2	4
5	Electricity and Utility, water and waste collection (Omitted)	0	0	0
6	Construction, real estate and related activities	715	47	95
7	Wholesale	1006	36	129
8	Retail trade	222	14	38
9	Public transport/ postal services (Omitted)	0	0	0
10	Hospitality and tourism	160	6	30
11	Broadcasting, publishing	112	6	12
12	Information technology	210	3	26
13	Banking and insurance related activities (Omitted)	0	0	0
14	Consultancy and research	92	8	13
15	Renting and leasing	62	2	21
16	Repair and maintanence and other	2	0	0
	Total industry observations	4047	165	654
	missing observations	1557	529	156

A.2. Summary statistic (mean and medians for Irish and UK SMEs)

	Means and (Medians) of sample variables for each year							
Variables	2004	2005	2006	2007	2008	2009	2010	2011
Change in total debt	3.23	2.9	1.99	0.95	-3.81	-1.37	1.76	0
	(-.07)	(-0.13)	(-0.33)	(-0.87)	(-3.36)	(-1.79)	(-.23)	(-0.95)
Total debt ratio	0.32	0.33	0.32	0.32	0.32	0.31	0.31	0.31
	(0.26)	(0.27)	(.25)	(.25)	(.25)	(.24)	(.24)	(.24)
long term debt ratio	.18	.18	.19	.18	.18	.19	.18	.19
	(.09)	(.09)	(.09)	(.09)	(.10)	(.10)	(.09)	(.10)
Short term debt ratio	.20	.20	.20	.19	.19	.19	.19	.19
	(.11)	(.11)	(.11)	(.10)	(.10)	(.09)	(.09)	(.09)
Deficit	12.51	10.62	10.02	6.14	-9.22	.07	7.64	2.24
	(7.54)	(6.17)	(6.84)	(1.86)	(-11.28)	(-2.07)	(6.37)	(1.36)
Firm age*	22	23	24	25	26	27	29	30
	(17)	(18)	(19)	(20)	(21)	(23)	(24)	(25)
number of employees	59	60	59	59	60	59	59	60
	(45)	(46)	(45)	(44)	(45)	(46)	(45)	(46)
Annual GDP per capita growth	2.1	1.2	2.1	3.0	-2.2	-5.3	.8	-0.1
Profitiability ratio*	.04	-.03	.01	-.01	-.01	.03	.09	.09
	(.08)	(.07)	(.06)	(.06)	(.07)	(.06)	(.08)	(.08)
Tangibility*	.33	.33	.32	.32	.32	.32	.32	.31
	(.25)	(.24)	(.24)	(.23)	(.23)	(.23)	(.22)	(.22)
Growth Oppertunities	.10	.09	.08	.07	.08	.08	.08	.07
	(.03)	(.03)	(.03)	(.03)	(.03)	(.02)	(.03)	(.02)
Ndts	.04	.04	.03	.03	.03	.03	.03	.03
	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)
Risk	.17	.15	.14	.13	.12	.10	.10	.10
	(.07)	(.06)	.06)	(.06)	(.05)	(.04)	(.04)	(.04)

* In the regression analysis, the log of these variables is used.

A.3.1. Summary statistics for English SMEs 2004-2011

Variable	Obs	Mean	Std. Dev.	Min	Med	Max
Total assets	34,801	8,400,000	8,200,000	11,823	6,100,000	43,000,000
Total debt	14,365	3,200,000	4,700,000	10,047	1,600,000	78,000,000
Deficit	34,801	5	31	-90	3	244
Deficit squared	4,801	1,174	4,597	0	142	81,327
Firm age	34,801	27	21	1	21	141
number of employees	34,699	58	52	1	44	249
Annual GDP per capita growth	34,801	0.24	2.44	-5.00	1.00	3.00
EBIT	34,767	0.04	0.38	-3.10	0.08	2.65
longtermdebt	15,214	1,600,000	3,200,000	1,236	510,000	56,000,000
Tangibility	34,801	0.30	0.28	0.00	0.21	0.98
Turnover	29,138	14,000,000	16,000,000	7,916	9,800,000	100,000,000
Short-term debt	27,545	1,800,000	3,600,000	214	570,000	79,000,000
Change in total debt	12,983	0.77	14.60	-46.21	-0.79	96.04
longtermdebt ratio	15,214	0.18	0.27	0.00	0.09	2.04
Short term debt ratio	27,545	0.20	0.27	0.00	0.10	1.83

A.3.2. Summary statistics for Irish SMEs 2004-2011

Variable	Obs	Mean	Std. Dev.	Min	Med	Max
Total assets	5,484	2,500,000	5,300,000	11,823	370,000	42,000,000
Total debt	1,043	1,500,000	2,600,000	10,047	460,000	20,000,000
Deficit	5,484	7.50	37.82	-89.54	2.24	244.10
Deficit squared	5,484	1,893.97	6,637.71	0.02	128.83	81,327.5
Firm age	5,484	17	14	1	14	133
number of employees	2,380	24	35	1	10	240
Annual GDP per capita growth	5,484	-0.24	3.83	-8.00	3.00	3.00
EBIT	5,447	0.03	0.58	-3.10	0.04	2.65
longtermdebt	1,346	960,000	1,900,000	1,236	220,000	17,000,000
Tangibility	5,484	0.46	0.34	0.00	0.43	0.98
Turnover	4,531	3,100,000	8,800,000	7,916	280,000	93,000,000
Short-term debt	2,296	620,000	1,900,000	214	37,272	24,000,000
Change in total debt	896	0.45	13.94	-46.09	-1.23	96.04
longtermdebt ratio	1,346	0.29	0.37	0.00	0.15	2.04
Short term debt ratio	2,296	0.15	0.25	0.00	0.05	1.83

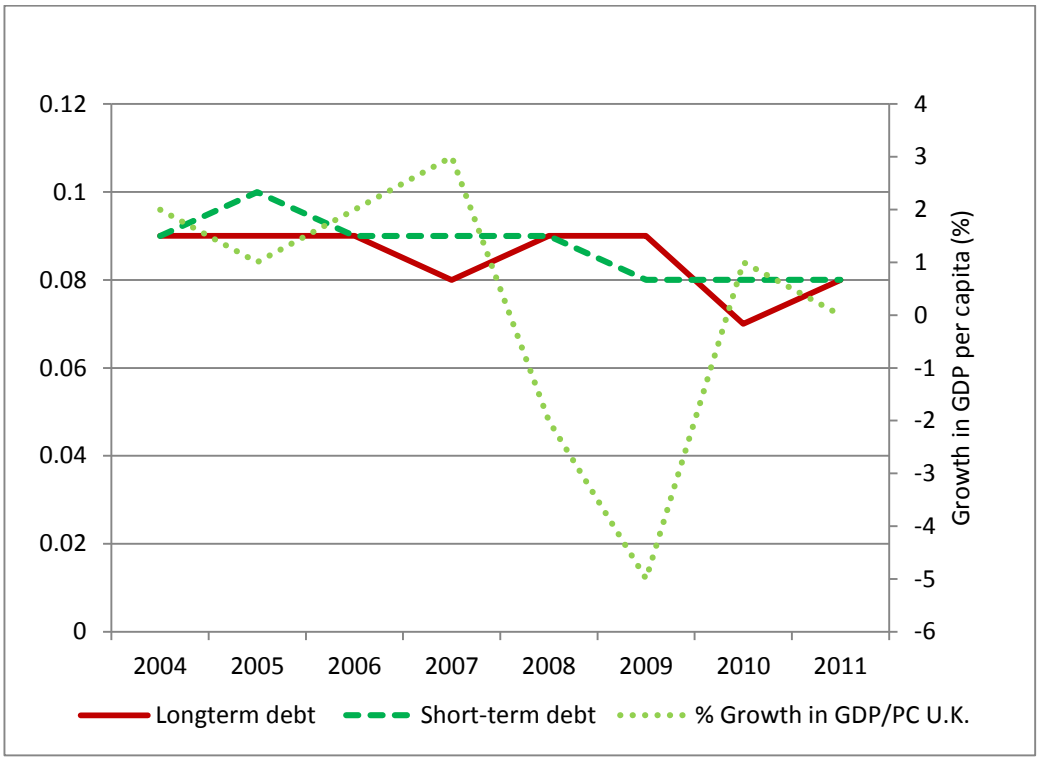
A.3.3. Summary statistics for Scottish SMEs 2004-2011

Variable	Obs	Mean	Std. Dev.	Min	Med	Max
Total assets	6,365	11,000,000	8,900,000	13,131	8,000,000	43,000,000
Total debt	2,917	4,100,000	6,100,000	10,699	2,100,000	66,000,000
Deficit	6,365	4.89	29.79	-89.54	3.04	244.10
Deficit squared	6,365	1,106.29	4,366.20	0.02	148.10	81,327.49
Firm age	6,365	30	23	1	23	124
number of employees	6,014	86	59	1	75	249
Annual GDP per capita growth	6,365	0.26	2.44	-5.00	1.00	3.00
EBIT	6,358	-0.04	0.48	-3.10	0.07	0.93
longtermdebt	3,038	2,200,000	4,700,000	1,236	720,000	65,000,000
Tangibility	6,365	0.34	0.28	0.00	0.26	0.98
Turnover	4,910	18,000,000	16,000,000	17,851	12,000,000	100,000,000
Short-term debt	5,182	2,300,000	4,400,000	214	800,000	76,000,000
Change in total debt	2,657	0.98	16.03	-46.21	-0.80	96.04
longtermdebt ratio	3,038	0.18	0.26	0.00	0.09	2.04
Short term debt ratio	5,182	0.20	0.26	0.00	0.10	1.83

Table A.16 Change in total debt ratios by SME age

Table A.17 Debt ratios of micro enterprises

Table A.18 Debt ratios of medium sized enterprises



A.21.Summary of support for hypotheses in Empirical analysis

Summary of Support for the hypotheses in the Empirical Analysis.

Hypothesis	Empirical Evidence	Model	Dependent variable
H1	Strongly supported	Pooled OLS model, Fixed Effects, Fixed Effects plus time dummies	Change in total debt variable, long term debt and short term debt
H2	Strongly supported	Pooled OLS model, Fixed Effects, Fixed Effects plus time dummies	Change in total debt variable, long term debt and short term debt
H3	Strongly rejected	Fixed Effects model	Total debt to total assets
H4	Weakly supported	Pooled OLS model, Fixed Effects, Fixed Effects plus time dummies	Change in total debt variable, long term debt and short term debt
H5	Strongly supported	Fixed Effects model	
H6	Strongly supported	Pooled OlS Model	Change in total debt variable
H7	Weakly supported	Fixed Effects model	Total debt to total assets
H8	Weakly supported	Fixed Effects model	long term debt to assets
H9	Weakly supported	Fixed Effects model	Short term debt to assets

* Strongly supported means that the estimated coefficient is in line with the direction of causation implied by the hypothesis and the estimated coefficient is statistically significant at the 5% level.

* Weakly support means that the estimated coefficient is in line with the direction of causation implied by the hypothesis, however the estimated coefficient is not statistically significant at the 5% level.

Appendix B: From Chapter 3

Table 1.1 Crosstabulations of variables used in study

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Trade Debtors	(1)	1.00															
Tradecreditors	(2)	0.14	1.00														
Net creditor	(3)	0.63	-0.31	1.00													
Trade creditorassets	(4)	0.03	0.35	-0.36	1.00												
Trade debtorassets	(5)	0.58	0.02	0.44	0.18	1.00											
Net credita	(6)	0.30	-0.33	0.58	-0.86	0.34	1.00										
Firm age	(7)	0.00	0.00	0.00	0.00	0.01	0.00	1.00									
Cashta	(8)	-0.37	0.02	-0.25	-0.15	-0.58	-0.14	-0.03	1.00								
Cashflowta	(9)	-0.01	0.03	-0.01	-0.01	0.00	0.04	0.00	0.00	1.00							
Loansta	(10)	-0.03	0.06	-0.05	0.19	0.00	-0.15	-0.01	-0.06	-0.08	1.00						
Invest	(11)	-0.01	0.00	-0.02	-0.01	-0.02	0.00	-0.01	0.01	0.01	-0.01	1.00					
Opprev	(12)	-0.13	0.00	-0.09	0.28	-0.03	-0.23	-0.02	-0.02	-0.07	0.43	-0.01	1.00				
Total assets	(13)	0.03	-0.09	0.01	-0.02	0.06	0.05	0.07	-0.28	0.00	-0.04	0.01	-0.08	1.00			
PcreditGDP	(14)	0.07	0.07	0.02	0.12	0.16	-0.02	0.05	0.02	0.02	0.03	-0.09	-0.02	0.03	1.00		
irmoney market	(15)	-0.03	-0.02	-0.01	0.01	0.00	-0.01	-0.02	0.00	0.00	-0.01	0.09	0.01	0.01	-0.29	1.00	
intangibility	(16)	0.03	0.01	0.00	0.05	0.05	-0.04	-0.01	-0.09	0.00	0.04	0.01	0.02	0.05	-0.01	0.00	1

Table 1.2 Average (mean) levels of trade credit extended by sector

Industry sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average	β
Food processing/manufacturing		0.13	0.12	0.17	0.17	0.16	0.16	0.19	0.18	0.16	.007**
Construction		0.06	0.09	0.18	0.22	0.19	0.25	0.24	0.2	0.18	.023**
Real estate		0.13	0.09	0.24	0.27	0.28	0.3	0.34	0.36	0.25	.036***
Wholesale		0.22	0.21	0.23	0.24	0.24	0.24	0.22	0.2	0.23	-.001
Retail trade		0.08	0.06	0.07	0.08	0.06	0.07	0.08	0.1	0.08	.002
Hospitality and Tourism		0.05	0.05	0.07	0.07	0.07	0.07	0.08	0.08	0.07	.004***
Business services		0.14	0.16	0.19	0.18	0.17	0.19	0.19	0.17	0.17	.004
Community services		0.02	0.03	0.05	0.05	0.04	0.05	0.05	0.05	0.04	.003**
Average across years		0.10	0.10	0.15	0.16	0.15	0.17	0.17	0.17	0.15	

* Trade credit extended is calculated as trade receivables divided by the total sales of the firm in each year
* β is the estimated coefficient the regresssion $TC = \alpha + \beta_1(year) + \varepsilon_1$, indicating how much trade credit extended has reduced/increased for each sector for each year of the sample from a simple pooled regression with no control varaibles. Positive values of β indicate an increase in average levels of trade credit extended in a given sector over the sample period, while negative values of β indicate how much they have reduced. ***, **, * represent statistical significance at the 1%,5% and 10%

Table 1.3 Average (mean) levels of Net credit extended by sector

Industry sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average	β
Food processing/manufacturing		0.09	0.1	0.07	0.07	0.04	0.001	-0.0006	0.024	0.05	-0.014**
Construction		0.04	0.06	0.02	0.08	0.06	0.007	0.005	-0.03	0.03	-.0009*
Real estate		0.08	0.09	0.1	0.14	0.15	0.18	0.19	0.22	0.14	.020***
Wholesale		0.19	0.11	0.14	0.12	0.08	0.06	0.07	0.06	0.10	-.016***
Retail trade		-0.02	-0.03	-0.03	-0.05	-0.06	-0.06	-0.04	-0.06	-0.04	-.005**
Hospitality and Tourism		0.002	0.005	0.001	-0.001	-0.006	-0.011	-0.0002	-0.002	0.00	-.006*
Business services		0.05	0.07	0.05	0.08	0.05	0.06	0.06	0.066	0.06	.001
Community services		0.001	0.005	0.006	0.004	0.001	0.004	0.001	0.008	0.00	.0002
Average across years		0.05	0.05	0.04	0.06	0.04	0.03	0.04	0.04	0.04	

* Net credit is calculated as trade receivables minus payables divided by the total sales of the firm in each year
* β is the estimated coefficient the regresssion $TC = \alpha + \beta_1(year) + \varepsilon_1$, indicating how much trade credit extended has reduced/increased for each sector for each year of the sample from a simple pooled regression with no control varaibles. Positive values of β indicate an increase in average levels of trade credit extended in a given sector over the sample period, while negative values of β indicate how much they have reduced. ***, **, * represent statistical significance at the 1%,5% and 10%

Appendix C: From Chapter 4

Table 4.12 Firm Descriptive Statistics

Firm Level Variables	Short description	# obs	Mean	Median	Std. Dev.
Dependent variables					
Net TC	Trade receiveables minus payables scaled by sales	1,823,274	0.11	0.06	0.21
Netcredit/ Bank credit	Receiveables minus payables scaled by bank debt outstanding	1,469,757	0.24	0.15	0.91
Trade credit receieved	Accounts payable scaled firm input costs	1,707,963	0.81	0.15	3.54
Trade credit extended	Accounts receiveable scaled by sales	1,828,115	0.2	0.14	0.22
Net received	Accounts payable minus receivables over sales	1,562,915	-0.12	-0.07	0.23
Independent varaibles					
Size	Log of total assets (Fixed and current assets)	2,418,248	13.83	13.88	1.68
Sales growth	Firm sales in year1 - sales in year0/ sales in year 0	1,759,909	0.1	0.04	0.42
Firm age	Number of years since incorporation	2,822,273	18	14	17
Loansta	Short-term financial debts and part of longterm financial debts payable within one year scaled by firm assets	693,615	0.11	0.01	0.25
Cashta	Amount of cash in hands of firm and deposited in bank scaled by firm assts	2,021,025	0.18	0.1	0.21
Opprev	Net sales plus other revenues scaled by firm assets	2,238,733	2.03	1.66	1.56
Invest	Growth in firm investment measured in percent	2,069,019	0.5	-0.02	304.03
Employees	Number of employees	2,065,852	25	12	37
Cashsa	Total cash and deposits of firm scaled by sales	1,816,013	0.14	0.06	0.26
AP/ total debt	Accounts payable to total debt	1,586,610	0.28	0.24	0.29
Debt/Assets	Total debt to total assets	1,604,048	0.61	0.6	0.31

Table 4.13 Cross-tabulations of variables used in this chapter

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
Total assets	(1)	1																											
Firm age	(2)	0.10	1.00																										
Loansta	(3)	0.08	0.00	1.00																									
Opprv	(4)	0.00	0.00	0.02	1.00																								
Trade credit extended	(5)	0.17	0.00	0.04	-0.31	1.00																							
Trade credit received	(6)	0.03	-0.01	-0.01	-0.03	0.10	1.00																						
Debtor days	(7)	0.14	0.00	-0.01	0.00	0.95	0.08	1.00																					
Creditor days	(8)	0.20	0.03	0.00	0.00	0.25	0.17	0.28	1.00																				
Trade credit over assets	(9)	0.00	0.00	0.02	0.01	0.00	0.11	0.00	0.23	1.00																			
Sales growth	(10)	0.01	-0.06	-0.03	0.06	-0.05	0.01	-0.03	0.01	0.02	1.00																		
Total debt	(11)	0.85	0.08	0.28	-0.02	0.19	0.04	0.16	0.26	0.01	0.02	1.00																	
Net TC	(12)	0.06	-0.02	0.00	-0.25	0.83	-0.02	0.80	-0.26	-0.25	-0.04	0.02	1.00																
cashta	(13)	-0.18	-0.01	0.00	0.03	-0.20	0.02	-0.23	-0.16	0.00	0.01	-0.18	-0.13	1.00															
Employees	(14)	0.53	0.08	0.01	0.00	0.06	0.01	0.04	0.12	0.00	-0.02	0.48	-0.01	-0.14	1.00														
Bank conc	(15)	-0.19	-0.04	-0.04	0.00	-0.12	-0.09	-0.08	-0.16	-0.01	0.02	-0.24	-0.02	0.07	-0.27	1.00													
GDPpcg	(16)	-0.08	-0.06	-0.09	0.00	-0.09	0.00	-0.08	0.02	0.00	0.16	-0.08	-0.11	0.00	0.03	-0.10	1.00												
invest	(17)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00											
insolvent	(18)	0.00	0.00	0.03	0.00	0.04	0.01	0.05	0.04	0.00	-0.01	0.01	0.03	-0.05	0.00	0.00	-0.03	0.00	1.00										
Regulation quality	(19)	-0.06	0.03	0.18	0.00	-0.28	-0.06	-0.31	-0.24	0.00	0.01	-0.08	-0.15	0.23	-0.10	0.38	-0.12	0.00	-0.01	1.00									
Political stability	(20)	-0.20	-0.03	-0.04	0.00	-0.27	0.03	-0.27	0.09	0.01	0.03	-0.27	-0.33	0.19	-0.16	0.43	0.18	0.00	-0.04	0.36	1.00								
PcreditGDP	(21)	0.04	0.03	0.19	0.00	0.13	-0.06	0.11	-0.04	0.00	-0.08	-0.02	0.18	0.05	0.08	0.08	-0.41	0.00	0.02	0.16	-0.09	1.00							
SME interest rate	(22)	-0.05	-0.07	-0.13	0.00	0.10	0.02	0.10	0.06	0.00	-0.01	-0.03	0.01	-0.09	0.14	-0.26	0.20	0.00	-0.02	-0.36	0.04	-0.11	1.00						
Cashsa	(23)	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	-0.01	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	1.00					
Composite Risk	(24)	-0.13	0.00	-0.01	0.00	-0.36	0.00	-0.37	-0.04	0.00	0.02	-0.17	-0.33	0.14	-0.15	0.40	0.19	0.00	-0.05	0.55	0.70	-0.13	-0.27	0.00	1.00				
English origin	(25)	0.13	0.03	0.21	0.01	.	.	-0.12	-0.04	0.01	.	0.21	.	0.37	0.24	-0.31	-0.07	0.00	-0.01	0.47	-0.09	0.30	0.00	0.01	-0.04	1.00			
French origin	(26)	0.12	0.04	-0.03	0.00	0.31	0.03	0.36	0.11	0.00	-0.03	0.13	0.28	-0.16	-0.05	-0.03	-0.34	0.00	0.07	-0.39	-0.54	0.12	-0.24	0.00	-0.68	-0.35	1.00		
Scandinavian origin	(27)	-0.20	-0.02	.	0.00	-0.30	-0.05	-0.29	-0.13	-0.01	0.02	-0.23	-0.22	0.10	-0.25	0.67	0.06	0.00	-0.03	0.60	0.69	-0.01	-0.31	0.00	0.85	-0.19	-0.48	1.00	
German origin	(28)	0.09	0.06	-0.03	0.00	-0.06	0.00	-0.06	-0.03	0.00	0.00	0.06	-0.04	-0.02	0.10	0.01	0.00	0.00	0.00	0.08	-0.08	-0.04	-0.04	0.00	0.18	-0.04	-0.11	-0.06	1.00
Socialist	(29)	-0.06	-0.04	-0.12	0.00	-0.04	0.00	-0.03	-0.09	-0.01	0.01	-0.06	-0.05	-0.06	0.05	-0.05	0.08	0.00	-0.02	-0.13	0.05	-0.27	0.56	0.00	-0.18	-0.08	-0.19	-0.11	-0.02	1