A Work Project presented as part of the requirements for the Award of a Master's Degree in Economics from the NOVA School of Business and Economics.

Financial Crisis and capital structure decisions.

Were all the Portuguese SMEs in the same boat?

João Pedro Carvalho Fachada

Student Number: 40838

A Project carried out on the Master's in Economics Program, under the supervision of:

Professor Ana Fontoura Gouveia

Dra. Silvia Santos – GPEARI/Ministry of Finance

January 2021

Financial Crisis and capital structure decisions.

Were all the Portuguese SMEs in the same boat? [*]

João Pedro Carvalho Fachada

January 2021

Abstract:[†]

This study explores how the adverse macroeconomic scenario impact small and medium-sized enterprises capital structure, further exploring heterogeneous effects. We find that the financial crisis negatively impacted total debt ratio of Portuguese SMEs, but it was after the crisis that firms decreased their leverage the most, pointing to relevant legacy effects. Short-term debt was particularly affected, with the debt of lower maturity being partially replaced by long-term across the all period. We show that capital structure determinants are responsive to adverse macroeconomic conditions. We also document important heterogenous effects in the capital structure decisions of international and innovative firms during the financial crisis. Our findings reveal that young firms are higher indebted and have a less flexible capital structure. Furthermore, even though no inter-industry effects were found, we show how the higher indebted within industry were under more pressure to reduce their debt ratios.

Keywords: Financial Crisis; SMEs; Capital Structure; Heterogeneity.

[*] I would like to thank Professor Ana Fontoura Gouveia and Dra. Silvia Santos for their guidance and constant support through each state of the research process.

[†] This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1 Introduction

Small and medium sized enterprises (SME's)[1] have a crucial role in the economy, as they promote job creation, innovation and stimulate economic growth[2] (OECD, 2017). In 2018, they accounted for 99,8% of all enterprises in the EU-28 non-financial business sector, represented more than half of EU-28 GDP and 61,4% of total employment (European Comission, 2019). However, when compared to larger firms, SMEs are characterized by a less diversified set of funding sources, with less internal resources and with more obstacles in the access to external funding (Beck et al., 2008; Casey and O'Toole 2014; Lawless et al., 2015), which undermines their growth.

During the global financial crisis, the financing difficulties of SMEs were exacerbated, with recent research confirming how a constrained access to external finance could hamper firms' growth, not only by investments constraints, but also by restrictions on their operational activities and the legacy of those effects are still present in some countries (Beck and Demirguc-Kunt, 2006; Beck et al., 2008; Félix 2018; Musso and Schiavo 2008). Portugal, particularly hit by that crisis and characterized by a banking-based financial system, presented one of the worst performances on access to finance within EU-28 (European Commission, 2019). Moreover, Portuguese firms reveal difficulties in growth (Braguinsky et al., 2011) and those being credit constrained, presented in the years right after the financial crisis, a lower probability of survival and an inferior investment rate (Félix, 2018). Therefore, the firms' decisions around their capital structure is a critical aspect for SMEs.

[1] In this paper, we follow the definition of SME proposed by the standard European Commission definition (EU recommendation 2003/361), providing a comparable reference group across the European Union.

[2]Portugal ranks third in terms of the number of more SMEs per 1,000 inhabitants, with approximately 100 SMES per 1,000 inhabitants, the EU-28 average is 58 (European Commission, 2019). Moreover, the most recent statistics point out that in 2018 Portuguese SMEs represented 99,7% of the total number of firms, accounted for 57% of the total sales turnover and 79% of employment, (higher than EU average, 67%) ((Estudos da Central de Balanços 2019) and (INE, 2020)).

The empirical literature presents different findings on the effects of global financial crisis on the capital structure decisions of SMEs. Thus, this study explores how the adverse macroeconomic scenario impacted firm's capital structure. We contribute to the literature by exploring heterogeneous effects across five key dimensions: sector of activity, age class, innovation, internationalization, and leverage level. This heterogeneity is key for a thorough understanding of firms' developments, thereby providing crucial information to policy makers.

To do so, we exploit a large and detailed firm-level data source provided by BPLIM of Banco de Portugal. The data set encompasses harmonized information reported through IES (Simplified Business Information), over the period 2006 to 2018 and contains all Portuguese non-financial corporations.

Contrarily to existing literature for Sweden, UK and Germany (Yazdanfar et al., 2019 and Iqbal et al., 2014) we find that the financial crisis negatively impacted total debt ratio of Portuguese SMEs, but it was after the crisis that firms decreased their leverage the most, pointing to relevant legacy effects. Short-term debt was particularly affected, with the debt of lower maturity being partially replaced by long-term across the all period. We show that part of capital structure determinants are responsive to adverse macroeconomic conditions.

We find important heterogenous effects in the capital structure decisions of international and innovative firms during the financial crisis. Looking into firm age classes, we demonstrate that young firms are the higher indebted and have a less flexible capital structure. Although there are no inter-industry effects, we show how under bad economic conditions, the higher indebted within industry were under more pressure to reduce their debt ratios.

The remainder of this paper proceeds as follows. Section 2 presents a literature review on theoretical and empirical capital structure research. Section 3 refers to the data, descriptive statistics and the methodology followed. We discuss the empirical results in section 4, followed by summary of the findings and conclusion in section 5.

2 Literature Review:

2.1 Theoretical Framework and empirical studies:

The theoretical foundations of capital structure theory lay on Modigliani and Miller (1958) which states that "the value of a firm is completely independent of the capital structure" but acknowledging that their results were obtained under strict and demanding assumptions, that should be "relaxed in the direction of greater realism and relevance". From this point, new theories have emerged, none fully identifying all the factors that drive capital structure but with two standing out as more influential: the trade-off theory (TOT) and pecking order theory (POT).

The building block behind TOT begins in 1963, with Modigliani and Miller recognizing that there are tax advantages of using debt, rather than internal capital, which determines firms' valuation and capital structure decisions. Later, other authors called attention to other costs that need to be considered, namely bankruptcy costs and agency costs (Robichek and Myers, 1966; Jensen and Meckling, 1976). The TOT ends up being formalized in a dynamic version by Kane et al. (1984), clamming that there is an optimal level of debt that is reached when marginal benefits and marginal costs are perfectly balanced.

In contrast, POT does not determine an optimal capital structure, but states a hierarchy for firms' preferences regards the issue of new capital (Myers and Majluf, 1984 and Myers, 1984). The POT roots on signalling and asymmetric information between managers and investors (Ross, 1977 and Leland and Pyle, 1977), establishing that firms will prefer internal finance (e.g.: retained earnings) over debt and debt over equity. As claimed by Sogorb-Mira, (2005), this theory is easily applied to SMEs since managers tend do to be the shareholders and, in general, do not want to lose property and control.

The empirical literature on SMEs' capital structure and its determinants is manly based on the two theories previously described. We rely on those theories to define our explanatory

variables: age, size, asset structure, profitability, growth opportunities, firm risk, liquidity, and non-debt tax shield. Kumar et al. (2017) identifies this group of variables as "the most common" explanatory variables used in "the vast literature of capital structure". From both theories it is possible to predict expected impacts of explanatory variables on capital structure, which are supported by empirical evidence.

Table 1: Expected impact on leverage for explanatory variables

Variable	Expected Impact on Leverage		Theoretical Rational	Empirical Evidence
AGE	+	TOT	Older firms with past records, have a higher chance to establish their market position and end up with less information asymmetries, a lower bankruptcy probability and better credit conditions.	Abor and Biekpe, 2009
	-	POT	As firms get older, they became more likely to have retained internal funds and so the need of external financing is reduced.	Michaelas et al., 1999; Hall et al., 2004; Palacín-Sánchez et al., 2013; Migliori et al., 2018; López-Gracia et al., 2008; Balios, 2016; D'Amato, 2019;
SIZE	+	TOT	Larger firms go less often bankrupt as they are more diversified than small firms. The higher diversity reduces volatility of cash flows and profits.	Michaelas et al., 1999; Sogorb-Mira, 2005; López-Gracia el al., 2008; Degryse et al., 2010; D'Amato, 2019;
	-	POT	The increase in size gives the possibility to have more internal resources. Smaller firms tend to have more information problems and a higher risk level, this leads them to be more short-term debt dependent. Therefore, as firms increase in size, they replace short-term debt by long-term debt.	Hall et al., 2004; Migliori et al., 2018;
ASSET STRUCTURE	+	TOT	A higher ratio would decrease financial distress costs and enable an easier access to external debt.	Michaelas et al., 1999; Sogorb-Mira, 2005; Degryse et al., 2010; Migliori et al., 2018;
	+	POT	Fixed assets could mitigate information asymmetries problems between shareholders and lenders by working as collateral.	
			Based on the assumption that firms match maturities of assets and liabilities (Myers, 1976), long term debt will be financed with fixed assets.	Hall et al., 2004; Abor and Biekpe, 2009; Palacín-Sánchez et al., 2013; D'Amato, 2019; Yazdanfar et al., 2019; Degryse et al., 2010
PROFITABILITY	+	TOT	Profitable firms will tend to have lower bankruptcy costs as they may be perceived as less risky and will have a positive relationship with leverage due to an incentive to achieve higher tax shields by reducing the tax burden on profits (D'Amato, 2019).	

	-	POT	Profits increase internal funds, which is the most preferred source of funding.	Michaelas et al., 1999; Abor and Biekpe, 2009; Sogorb-Mira, 2005; López-Gracia el al., 2008; Balios et al., 2016; Degryse et al., 2010; D'Amato, 2019
GROWTH OPPORTUNITIES	-	TOT	Higher growth tends to produce moral hazard effects that turn firms to take riskier behaviours. Consequently, these firms face a higher bankruptcy risk, translated into more difficulties to raise debt on favourable terms.	López-García et al., 2008;
	+	POT	Higher growth firms will more quickly exhaust their internal resources, as they believe that growth leads to more investment. Agency problem: as lenders do not perceive the growth as a higher capacity of repayment combine with moral hazard risks, long-term credit supply is reduced (Myers, 1976).	Michaelas et al., 1999; Hall et al., 2004; Sogorb-Mira, 2005; Abor and Biekpe, 2009; Degryse et al., 2012; Palacín-Sánchez et al., 2013; Balios et al., 2016; D'Amato, 2019
FIRM RISK	-	TOT	Positive relation between earnings volatility (proxy to firm risk) and the probability to fail, which will make harder access to financing.	Michaelas et al., 1999; Abor and Biekpe, 2009; Balios et al., 2016; D'Amato, 2019;
		POT	Firm's decision to accumulate cash and avoid foregoing investments with net positive value when they have a high volatility on earnings (Balios et al., 2016).	
LIQUIDITY	+	TOT	Firms with more liquid assets, have a positive working capital that allows for reduction in bankruptcy costs and in this way increases the incentives to resort in more debt.	
	-	POT	Current assets can act as internal funds, avoiding debt to finance firms' investments or works guarantee for long-term lenders, which creates an incentive on firms to preserve their liquidity and access long-term finance.	Migliori, et al., 2018; D'Amato, 2019
NDTS	-	TOT	Non-debt tax shields, such as accounting depreciation deductions and investment tax credits, could work as substitutes for debt tax shields and affect capital structure decisions (DeAngelo and Masulis, 1980). Firms use NDTS instead of debt to reduce tax burden.	Sogorb-Mira, 2005; López-Gracia el al. 2008; Migliori, et al. 2018; D'Amato, 2019

2.2 Applications to SME: the role of the macroeconomic context

In a recent review of studies on the determinants of firms' capital structure over the past 40 years, Kumar et al., (2017), highlights that few studies are dedicated to SMEs. However, this reality changed after the global financial crisis with growing literature for SMEs capital structure, pointing out differences compared to studies around larger firms.

The impact of global financial crisis on capital structure has also been a topic of empirical research, but there are a variety of contrasting findings.

2.2.1 International evidence

Demirgüç-Kunt et al. (2019), the most comprehensive and complete investigation that we know of, relied on a dataset from different dimensions (SMEs, large and publicly listed firms), across 75 countries over the period 2004–2011 and analyse how the global financial crisis impacted firm's capital structure, looking for cross country and within country similarities and differences. In their main results, they show how the crisis effects were more intense for SMEs, with evidence of a general reduction in leverage, particularly long-term debt, in developing and high-income countries. Kenourgios et al. (2019) in their analysis of EU-28 listed SMEs, find evidence that European crisis, has increased the leverage of firms for all country subgroups, expect for the core countries, with no difference on capital structure's behaviour for a three firm size category over the period 2005-2015.

Balios et al. (2016) in their assessment for Greek SMEs during 2009-2012, ends up concluding that the effects of capital structure determinants on leverage, do not change from a pre-crisis scenario to the crisis period. On the other hand, D'Amato (2019) and Yazdanfar et al. (2019), in their analysis for Italian and Sweden SMEs, respectively, concluded that financial crisis had an impact on capital structure determinants and debt levels. In addition, Yazdanfar et al. (2019), reveals how SMEs resort more heavily on short term debt to overcome the reduction of internal funds during the financial crisis, while, D'Amato (2019), concludes, that trade credit did not worked as a substitute of bank credit during financial crisis.

Using a two-step system generalized method of moments, with firm-specific and macroeconomic variables, Demirgüç-Kunt et al. (2019), investigates the possible change on the impacts of those variables across different macroeconomic states for Greece SMEs during 2004 to 2014. The results reveal that "SMEs are particularly vulnerable during the crisis on how their capital structure is being determined", as the macroeconomic variables, not under the control of SMEs' managers are more relevant in a crisis scenario. In a similar study but with a broader

geographical coverage (ten emerging countries), Herwadkar (2017), finds out that small firms with higher leverage were the ones with lower tangible assets but higher growth potential in a post-crisis period.

The asymmetric impacts on firm's capital structure from different macroeconomics scenarios is not exclusively explained by country or firm size differences. Degryse et al. (2012), finds out that inter and intra industry heterogeneity are important drivers of capital structure of Dutch SMEs. Albaity et al. (2013) and Chen and Yu (2011), show how internationalization is negatively related with debt ratio, for Malaysian and Taiwanese listed firms, respectively.

Overall, the international evidence points to an impact of global financial crisis on firm's capital structure, with asymmetric effects between and within countries.

2.2.2 Evidence on Portugal

For Portugal, there is some variety of literature in capital structure determinants, from studies for specifics industries (e.g.: Pacheco and Tavares (2015) for the footwear sector or Serrasqueiro and Nunes (2014) for the hotel industry) to research on differences of capital structure across regions (Matias and Serrasqueiro, 2017).

Matias and Serrasqueiro (2017), applying a fixed effects model to a sample of 11.061 SMEs over 2007 to 2011, finds statistically significant differences in debt levels, but with uniform capital determinant signs across regions, being most aligned with POT. In a different study, Serrasqueiro and Nunes (2012), reveal how age has a considerable influence on SMEs capital structure decisions, with young firms relying more on short-term debt, while old firms benefit from better conditions to access long-term debt. Lisboa (2017) and Pinto and Silva (2019), demonstrate that exports intensity has a negative impact on Portuguese SMEs leverage.

A study on the impact of financial crisis on the capital structure determinants in Portuguese SMEs is the one by Proença et al. (2014). In their study, they rely on sample of 12,877 firms over 2007 to 2010 and report a negative trend on Portuguese firm's debt ratio,

particularly short-term debt, during financial crisis. However, the authors acknowledge that the limited longevity of the sample ends up being a limitation of their analysis and further research with additional periods should be considered.

3 Description of data and research methodology

3.1 Data and Variables

The empirical analysis is based on firm-level data sourced from Banco de Portugal's Microdata Research Laboratory (BPlim). The data set relies on information reported through IES[3] –, over the period 2006-2018[4] - and contains economic, financial and employment information as well as firm descriptive information for all Portuguese firms.

We focus on active non-financial firms[5], with at least three employees and with positive turnover, common assumptions in the literature. Moreover, given that we focus on SME capital structure, we only consider those firms classified as micro, small or medium firms on at least one year of the analysis[6]. We thus depart from 171,841 firms with corresponding 1,626,881 firm-year observations.

We impose additional requirements related with consistency of reporting (i.e: fundamental accounting equalities, positive sales). The description of each condition and a summary table of firms and observations dropped is reported in the Appendix A.1.

The final dataset consisted of unbalanced sample of 64 473 firms with corresponding 680 330 observations over the period of analysis 2006-2018. Given the focus of our study, and following existing literature, the dependent variables considered are the ratio of total debt to

[3] *Informação Empresarial Simplicada* - (Simplified Business Information)

[4] In 2010, POC (Portuguese Accounting Plan) was replaced by SNC (Portuguese Accounting Standardization System). The BPlim harmonized the information, so "some accounting system have an approximate correspondence and others have no correspondence at all in SNC".

[5] Firms in liquidation were dismissed, so all firms that over the period have a firm's situation other than "in business" were dropped. Moreover, all firms which had value equal to 1 to the variable that identifies firms in liquidation were dropped. According to the Article 146 of the Portuguese Code of Commercial Companies, dissolved firms are required to add the expression "Em liquidação" to their name while they are in the liquidation process.

[6] Firms classified as large over the entire period were dropped; this allow us to still consider those SME that were able to grow.

total assets (rtd), further decomposed into long-term and short-term debt to total assets ratios for firm *i* in year *t.*[7] Our independent variables: age, firm size, asset structure, profitability, firm risk, growth opportunities, liquidity, and non-debt tax shields (NDTS), are in line with both the trade-off theory and pecking order theory, the two main theoretical approaches to SME's capital structure.[8]

As non-financial SMEs encompass a broad and diverse group, we extend the above analysis by exploring heterogeneous effects on the impact of the financial crisis on the firm's capital structure. We thus perform subgroup analysis by industry, internationalization, age classes, innovation capacity, and leverage level, relying on the following definitions:

- Industry: based on Portuguese Classification of Economic Activities - CAE-Rev.3 published in 2007 which is harmonised with European directories NACE Rev.2;
- Internationalization: A firm is an exporter if more than 10% of total sales comes from exports for at least two consecutive years based on Economic Bulletin, Banco de Portugal (2019);
- Innovative firm: if it belongs to the high and medium high technological activities within manufacturing industry or if it is a service classified as high technology and knowledge intensive according to Eurostat definition (Table A3 on the Appendix);
- Age classes: class 1 (up to five years), class 2 (from five to (not including) 10 years); class 3 (from ten to (but not including) 20 years); class 4 (more than 20 years) (Central Balance Sheet Studies, 2016 from Banco de Portugal);

[7] In SNC assets and liabilities were divided into "non-current" and "current", this new classification corresponds, roughly, to the "old" medium /long term and short term, respectively. As a result, we use current liabilities as a proxy to short term debt and non-current liabilities as a proxy to non-current liabilities.
[8] The definitions of both dependent and independent variables are presented in Table A2 – Appendix.

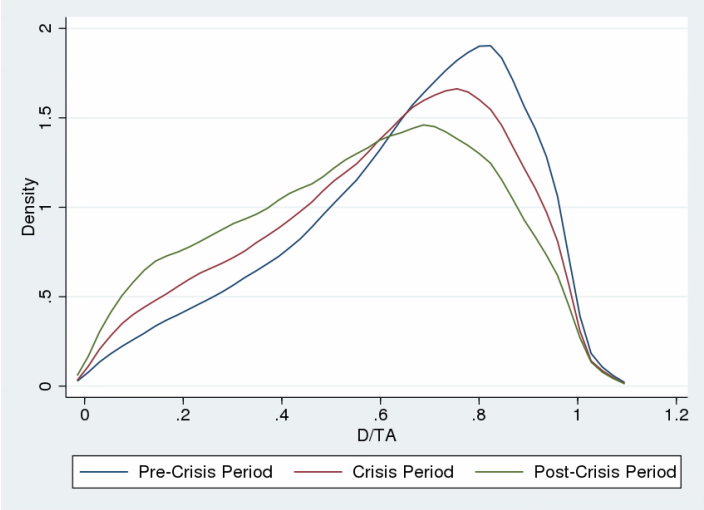
- Leverage Level considering the quantile distribution of total debt ratio. Additionally, we define high (low) leveraged if a firm has an average leverage in pre-crisis subperiod below (above) the correspondent industry median (D'Amato, 2019).

In respect to the time dimension, we considered three periods: pre-crisis from 2006 to 2008, crisis from 2009 to 2014 and post-crisis from 2015 to 2018. The end of crisis considers that Portugal ended the final assistance program in 2014 and that the process of early repayment of IMF loans started in 2015, which is also consistent with economic and financial signs of recovery (i.e: in 2015 the real GDP growth rate of 1,8%).

3.2 Descriptive Statistics

The 12 years under analysis covers a period of huge economic turmoil and structural adjustments in the Portuguese economy. The density distribution of total debt ratio for different combinations of periods depicted in Figure 1, corroborates this claim. As we can see, the debt ratio in the period of pre-crisis, presents a higher density at the extreme right values, and gradually moves through the left across the remaining periods. Table A4 in the Appendix confirms that all variations on the average debt ratios across periods are statistically significant at 1% level.

Figure 1: Kernel Density (post-crisis period vs crisis period)

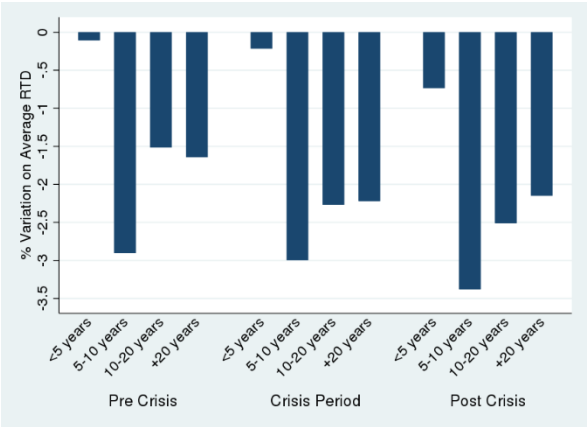


However, the Portuguese SMEs is a broad group with differences across several dimensions. In fact, Table A5 in the Appendix, shows how the firms with a higher total leverage ratio are characterized by being the younger, less profitable, and with higher growth opportunities. Also, both debt ratios maturities present a large dispersion, with short-term debt as the main component across all distribution.

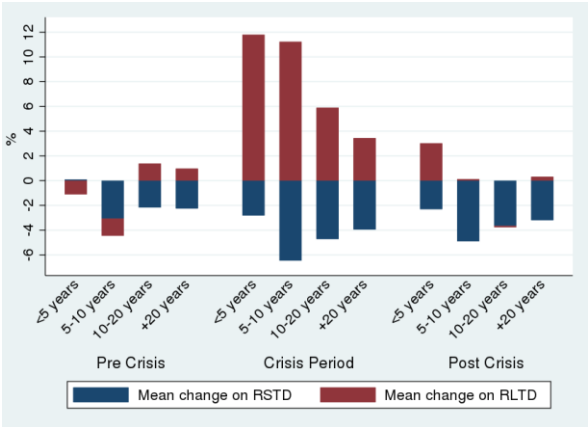
Besides being the higher indebted, young firms also present a contrasting path across periods. Figure 2 displays, how firms on different age classes, behaved on capital structure decisions across periods. We see that that during the crisis there is a significant substitution effect of short-term debt by long-term debt, for all age classes but with higher percentage variation for younger firms. The total debt ratio decreases across all periods and age classes but is higher after the crisis and is lower for younger firms.

Figure 2: Percentage Variation on Average Debt Ratios Across Periods and Age Classes

Panel A: Total Debt Variation



Panel B: Short and Long-Term Debt Variations



Notes: Figure 2 displays the average percentage variation on debt ratios across periods and age classes. Panel A presents the average debt variation for total debt and Panel B displays the average debt variation for short-term debt and long-term debt.

Beyond age, inter-industry heterogeneity may affect capital structure decisions (Michaelas et al., 1999; Degryse et al., 2010). Table 2 reveals that manufacturing industry, wholesale and retail trade, and construction, are the most representative sectors, with approximately 78%, and all have an average ratio of total and short-term debt that is above and statistically significant different from the national average.

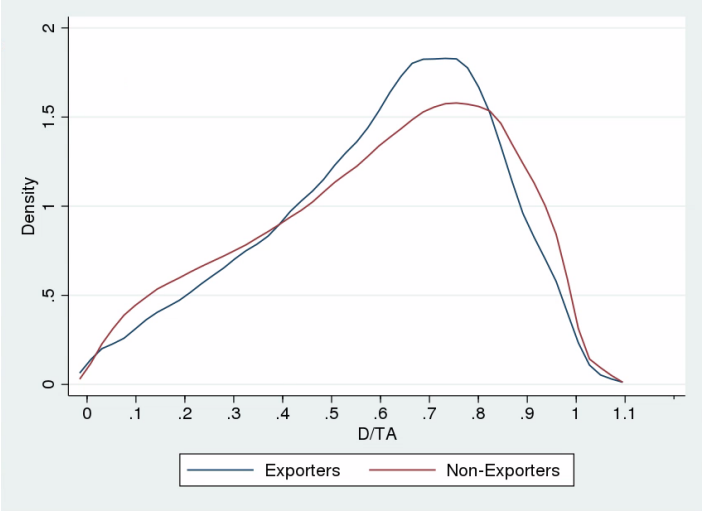
Table 2: Firm distribution and mean of total debt ratio by economic sectors

Economic Sector	Nº of firms	%	RTD (%)	RSTD (%)	RLTD (%)
Manufacturing Industry	15,702	24.35	59.97*	44.01*	16.20*
Construction	8,332	12.92	63.85*	47.64*	13.56*
Wholesale and Retail Trade	25,955	40.26	59.72*	46.16*	15.57*
All-Sectors	**64,473**		**59.54**	**44.05**	**15.48**

Notes: Table 3 presents the firms distribution and mean of total debt ratio for the three sectors with a higher proportion of SMEs in the Portuguese economy. Based on authors computations based on IES database. The * represents the statistically significant difference at 1% level on the means of debt ratios of industry relative to national average.

We decide to explore the effect of internationalization in capital structure decisions, since the dynamics on the export sector were an important factor on the economic recovery process of Portugal (IMF, 2018). In our sample, the percentage of export firms, increased from 10,08% in 2007 to 14,47% in 2018 (Table A6, Appendix). Considering the total debt density distribution, Figure 3, we verify that exporters have a higher density of total debt ratio from approximately 40% up to 90%, while at both extremes are the non-exporter firms.

Figure 3: Kernel Density (exporters vs non-exporters)



Contrarily, firms from high and medium-high technological activities within manufacturing industry, have a higher density at lower debt ratio (Figure A1, Appendix). In line with this result are the fact that these activities present a higher equity ratio (41% and 45%, respectively), with foreign direct investment representing 51% and 26% of total equity, respectively (Banco de Portugal, 2016). Additionally, we confirm that the differences on the average debt ratios for exporters, high technological services, and industries relative to their counterparts are statistically significant (Appendix - Table A7 and A8).

3.3 Model and Methodology

The methodology follows previous studies (i.e: Migliori et al., 2018; D'Amato, 2019; Yazdanfar et al., 2019).

$$(1)\ Leverage_{it} = \alpha + \beta x_{it} + \gamma C_t + \tau PC_t + \varepsilon_{it}$$

The dependent variable $Leverage_{it}$ is represented by the ratio's D/TA, decomposed in the two ratios LTD/TA and STD/TA of firm *i* in year *t.* On the right-hand side of the equation x_{it} represents a matrix of explanatory variables that characterise firm *i* in year *t* (i.e.: age, size, profitability, liquidity) and β represents the vector of variable coefficients. To account for the impact of different macroeconomic conditions, two different models are estimated, one considering the two dummies variables C_t and PC_t**,** representing the crisis period and the post crisis period, respectively: and the other considering year fixed effects. Finally, ε_{it} represents the error term, composed by an unobservable individual-specific effect that is time-invariant.

In this paper we will also evaluate the change in capital structure determinants during the different economic states by estimating the model for each subperiod separately. From this analysis, we can explore changes on capital structure determinants across different macroeconomic states.

The selection of proxies to employ as explanatory variables follow the existent literature. We consider different definitions for each capital structure determinant, namely: firm risk measured through the interest coverage ratio or profitability deviation, growth opportunities, assessed by the annual growth in assets our in sales and firm size, proxied by the logarithm of sales, assets or the number of employees. The combinations of different variables definitions ended up leading to similar conclusions in terms of the sign of coefficients but with significant variations in terms of statistical significance of each coefficient. We select the group of variables more fitted to the Portuguese reality and with a largest individual statistical significance on the different estimations.

In addition to the above analysis, this paper contributes to the literature by exploring asymmetric effects of the financial crisis on capital structure decisions, considering sector, export status, innovation classification, age class and leverage level.

The regressions are estimated using a fixed effect model supported by the F-test and Hausman test, that reject the pooled OLS and the random-effects model against fixed effect panel model, and with robust standard errors as the White Test indicates the presence of heteroscedasticity. The VIF test also suggests that there is no multicollinearity problem as figures were below 10. In all models, most of the coefficients are statistically significant at 1% level.[9]

4 Empirical Results

4.1 The determinants of capital structure and debt maturity: General Approach

The results of the General Approach are reported in Table 6. Regarding total and short-term debt regressions, both the dummies for the "on crisis" and "post crisis" periods are negative and statistically significant (in opposition to the results of Proença et al., (2014)). As expected from the analysis on the descriptive statistics, firms reduced their leverage levels in both periods, with more intensity after the crisis. The regressions with year fixed effects also reveals that, although at a lower scale, the negative trend started even before the crisis and constantly increases over time.

In respect to long term debt ratio regression, there is evidence of a positive relation with both crisis dummy variables, indicating that in these periods long term debt represented more

[9] In unreported regressions, we alternatively consider only the firms that did not left the market during the period under analysis, corresponding to less 11,232 firms comparing with the previous regression. We confirm that our results remain the same to those reported. To mitigate potential endogeneity issues derived from simultaneity bias, we ran regressions where each independent variable is lagged one period. (D'Amato, 2019 and Degryse et al., 2010). The relations obtained remain consistent with those reported (Appendix -Table D1).

in terms of total assets. Contrarily to Italian and Swedish evidence, on which all debt maturities are negatively impacted by the financial crisis (D'Amato, 2019; Yazdanfar et al., 2019).

Table 6: Regression Results -General Approach:

	TD/TA		STD/TA		LTD/TA	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Age (log)	-0.0978***	-0.0836***	-0.110***	-0.0919***	0.0126***	0.00834***
	(0.00143)	(0.00160)	(0.00148)	(0.00165)	(0.00113)	(0.00128)
Firm Size -Assets	0.0807***	0.0795***	0.0441***	0.0417***	0.0366***	0.0378***
	(0.00207)	(0.00207)	(0.00176)	(0.00175)	(0.000970)	(0.000983)
Asset Tangibility	0.0659***	0.0677***	-0.129***	-0.126***	0.195***	0.194***
	(0.00350)	(0.00350)	(0.00380)	(0.00379)	(0.00353)	(0.00352)
Profitability	-0.390***	-0.396***	-0.252***	-0.262***	-0.137***	-0.134***
	(0.00344)	(0.00344)	(0.00370)	(0.00370)	(0.00291)	(0.00292)
Firm Risk	-0.0345***	-0.0271***	-0.00231	0.00459	-0.0322***	-0.0317***
	(0.00489)	(0.00487)	(0.00524)	(0.00522)	(0.00412)	(0.00412)
Growth Opportunity	0.00531***	0.00595***	0.00443***	0.00551***	0.000878**	0.000435
	(0.000258)	(0.000260)	(0.000344)	(0.000345)	(0.000300)	(0.000301)
Liquidity	-3.62e-09***	-3.22e-09**	-1.45e-08***	-1.42e-08***	1.09e-08***	1.10e-08***
	(1.00e-09)	(9.94e-10)	(2.52e-09)	(2.52e-09)	(1.65e-09)	(1.64e-09)
NDTS	0.389***	0.353***	0.440***	0.382***	-0.0517***	-0.0285*
	(0.0126)	(0.0128)	(0.0141)	(0.0141)	(0.0120)	(0.0121)
Crisis Period	-0.0321***		-0.0562***		0.0240***	
	(0.000721)		(0.000878)		(0.000753)	
Post-Crisis Period	-0.0616***		-0.0887***		0.0272***	
	(0.00116)		(0.00128)		(0.00107)	
Reference Year						
2007		-0.00622***		0.00242**		-0.00864***
		(0.000457)		(0.000757)		(0.000668)
2008		-0.0175***		-0.00878***		-0.00869***
		(0.000646)		(0.000934)		(0.000802)
2009		-0.0291***		-0.0243***		-0.00485***
		(0.000792)		(0.00107)		(0.000907)
2010		-0.0366***		-0.0672***		0.0305***
		(0.000929)		(0.00123)		(0.00107)
2011		-0.0470***		-0.0721***		0.0251***
		(0.00105)		(0.00134)		(0.00116)
2012		-0.0531***		-0.0712***		0.0181***
		(0.00118)		(0.00144)		(0.00123)
2013		-0.0535***		-0.0744***		0.0210***
		(0.00128)		(0.00151)		(0.00129)
2014		-0.0597***		-0.0919***		0.0322***
		(0.00138)		(0.00159)		(0.00136)
2015		-0.0693***		-0.0996***		0.0303***
		(0.00148)		(0.00167)		(0.00142)
2016		-0.0784***		-0.106***		0.0281***
		(0.00157)		(0.00175)		(0.00148)
2017		-0.0868***		-0.107***		0.0204***
		(0.00167)		(0.00184)		(0.00155)
2018		-0.0958***		-0.119***		0.0230***
		(0.00178)		(0.00195)		(0.00165)
Constant	-0.193***	-0.199***	0.225***	-0.223***	-0.419***	-0.422***
	(0.0258)	(0.0253)	(0.0216)	(0.0214)	(0.0120)	(0.0121)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes
N	680329	680330	680330	680330	680330	680330
R^2	0.214	0.219	0.169	0.17622	0.060	0.064
F	2,821.2058	1,638.2809	3,025.7252	1,607.9769	1,191.1512	662.02416

Notes: The table presents the regression results of equation (1), using total debt ratio, short-term debt and long-term debt ratios as dependent variables. Due to heteroskedasticity identified we used robust standard errors clustered at firm level. Standard errors are reported in parentheses. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

The signs of coefficients for firms' regressors are explained by both the pecking order theory (age, profitability, and growth opportunities) and the trade-off theory (firm size and asset tangibility).

The negative sign of firm age on TD and STD regressions, indicates that older firms run on a lower indebtedness position. In the literature this result is justified by mature firms having more funds retained for their current activities on which they can rely as an alternative to debt. The exception is long term debt ratio, with positive relation with age. Considering that older firms will have more track records and opportunities to stablish their market position, they end up reducing asymmetric information problems and reach better external finance conditions. We will further explore the non-linear relation of leverage ratios over the life cycle of firms.

The positive relation of size measured by the logarithm of assets across regressions, can be interpreted as larger firms having more financing needs, and/ or firms of lower dimension presenting more difficulties in the access to finance. Consistent with POT, Table 6 reports a positive relation between asset tangibility and total debt ratio, meaning that firms with more proportion of tangible assets, rely more on debt. The sign turns negative for short term debt, implying that the relation on total debt ratio derives entirely from the positive effect on long-term debt. In general, short-term debt does not require a collateral and those firms with higher proportion of tangible assets, make use of it to overcome potential credit access barriers on debt of longer maturity.

The negative relation between profitability**,** across all regressions, indicates that firms with more profits operate in a less in debt position, which seem to confirm the preference for internal funds. Firm's risk coefficients are also negative across all regressions, with a non-significant coefficient for short-term debt regression. The difficulties in access to finance for riskier firms

act with more intensity on long-term debt, once this debt maturity is more demanding in terms of access requirements.

As predicted by the POT, growth opportunity, captured through annual sales growth, has a positive sign in all regressions. The explanation behind this result may be the fact that firms with higher growth, find it harder to generate enough internal resources to finance their investments and end up resorting on debt.

Firms with a higher liquidity, meaning higher current assets relatively to current liabilities, have, on average, lower levels of total debt, particularly short-term leverage, while simultaneously present a higher ratio of long-term debt. This relationship between liquidity and the different debt maturities was also found in other studies for Portuguese and Italian firms, with a similar interpretation that firm managers use liquid assets has a guarantee to access long-term finance (Laureano et al., 2012; Proença et al., 2014; D'Amato, 2019). Overall, the liquidity and growth opportunity present coefficients of low magnitude.

Lastly, non-debt tax shields, shows a significant positive effect on total debt that derives entirely from short-term debt, and goes against the theoretical predictions in TOT. A firm with a higher NDTS, expects a lower tax rate, that enables an easier access to higher leverage. The results seem to suggest that NDTS is an important factor, particularly for those firms with more difficulties in accessing external debt, as those are the ones that tend to rely more on short term debt.

4.2 General approach under different macroeconomic states

In this chapter, we analyse how capital structure determinants change across the three different moments in time: before, during and after the crisis. The regressions were estimated by fixed effects panel model with robust standard errors, based on the results of the specific tests for each regression. According to the results reported in Table 7, there is some inter-period variation on the relation of firm characteristics and leverage ratios.

Highlighting the differences towards the general approach, we find that age only have a positive impact on long-term debt on the crisis period, suggesting that for older firms these was an alternative to potential reductions on internal funds, coming from low levels of profitability and sales. In agreement to this prediction, we see the alternation of signals in the coefficients on growth opportunities, with a negative signal before and after the recession, which does not happen on STD with growth opportunities always leading to liquidity funding needs. Moreover, in opposition, to the negative signal on the general approach for long-term regressions, NDTS, presents (only) a statistically significant and positive result on the post crisis period. So, the savings on taxes derived from shield effect of higher depreciation expenses, ended up, creating an incentive to generate more short- and long-term debt only in the economic recovery period.

Overall, the signals on capital structure determinants only differ on the crisis period, which confirms that firms react on negative macroeconomic scenarios. In respect to the short-term debt regressions, the relations of capital structure determinants remain constant, with an exception, not statistically significant on NDTS. We also see a constant increase on the positive impact of asset tangibility on long-term debt ratio, pointing that collateral became more valuable to overcome credit access barriers and access debt of longer maturity.

Table 7: Regression Results under different macroeconomic states

	TD/TA			**STD/TA**			**LTD/TA**		
	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis
	1)	2)	3)	4)	5)	6)	7)	8)	9)
Firm Age	-0.138***	-0.114***	-0.134***	-0.118***	-0.150***	-0.104***	-0.0199***	0.0365***	-0.0299***
Firm Size	0.143***	0.109***	0.109***	0.102***	0.0689***	0.0514***	0.0412***	0.0396***	0.0573***
Tangibility	0.0316***	0.0284***	0.0616***	-0.139***	-0.151***	-0.153***	0.170***	0.180***	0.215***
Profitability	-0.418***	-0.352***	-0.352***	-0.326***	-0.223***	-0.198***	-0.0919***	-0.129***	-0.153***
Firm Risk	0.00931	0.0317***	-0.0203**	0.0274*	0.0503***	0.0516***	-0.0181*	-0.0186**	-0.0255***
Gro. Oppor.	-0.0016***	0.00276***	0.00232***	0.00156*	0.00130**	0.00344**	-0.0031***	0.00146***	-0.00112*
Liquidity	-4.6e-08***	-1.22e-06***	1.78e-10	-5.46e-08**	-1.48e-06**	-8.04e-09***	8.65e-09	2.57e-07	8.22e-09***
NDTS	0.372***	0.377***	0.300***	0.392***	0.365***	0.221***	-0.0205	0.0113	0.0786***
Constant	-0.915***	-0.555***	-0.532***	-0.498***	-0.0568	-0.0182	-0.417***	-0.498***	-0.550***
N	151216	311908	217206	151216	311908	311908	151216	311908	217206
R^2	0.283	0.179	0.190	0.073	0.077	0.077	0.029	0.035	0.055
F	1358.059	1184.129	978.676	431.049	828.957		156.376	471.984	

Notes: The table presents the regression results of equation (1), considering each period separately. See appendix B. for a complete representation of the regressions results. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

5 The asymmetric effects of financial crisis

In the present section we explore to what extent there are heterogeneous effects on capital structure decisions of Portuguese SMEs under the different macroeconomic scenarios.

5.1 Industry effects

We start our analysis by introducing industry fixed effects to capture how industry-specific factors affect capital structure. The lack of statistical significance in most industry dummies seem to suggest that there are no inter-industry differences in capital structure of Portuguese SMEs. However, we further explore the industry effects, by considering the interaction between industry-specific characteristics with the different macroeconomic scenarios, and the previous conclusion remains.

We perform an additional analysis considering the three most representative industries mentioned in the descriptive statistics (Table C1 in the Appendix). The construction sector is one of those with the highest indebtedness levels and we highlight how the ratio of fixed assets in this industry, has a negative contribution to the ratio of total debt, conversely to the results obtained in the general approach. This divergency derives from the higher weight of short-term debt on total debt and the larger negative relation with this debt maturity. Even without statistically significance, its worth's to mention the negative values of both periods dummies coefficients on long-term debt, which indicates an alternative effect of financial crisis on construction firms, this may be related with more difficulties to access long-term finance. In line with this result is the fact that the construction industry presents the larger negative firm risk coefficient of the three industries and higher than the general approach results. Moreover, in the manufacturing industry, the ratio of fixed assets has a positive and significant effect on short-term debt, pointing out that, those firms with potential financial access problems ended up using their fixed assets as a guarantee on access to debt of this maturity.

Overall, the sectoral analysis, allow us to conclude that the capital structure decisions described in section 4 also apply for the most representative sectors of the economy and it is not significantly affected by inter-industry differences.

5.2 Internationalization and Innovation

In the present section by introducing interaction terms, we explore how the internationalization and innovation impacted the capital structure over different macroeconomic scenarios. In respect to innovation, since it was not possible to access information about R&D expenses or innovative products, we proxied innovation based on Eurostat aggregation of technological intensity for the manufacturing industry and services.

The empirical results, Appendix Table C2 and C3, confirmed that international and high technological industries follow a slightly different paths in respect to their capital structure decisions compared with their counterparts. Contrarily, looking into the services classified as high technological and knowledge intensive, the lack of statistical significance indicates that innovation does not play a role on capital structure decisions for this group of firms.

Concerning internationalization, we see that export status only negatively impacted short-term debt ratio, during the crisis, rather than in both periods. Indeed, Table 8, shows how after the financial crisis, export firms partially replace long-term debt by short-term debt, indicating that these group of firms follow different capital structure decisions. We further explore if this relation is derived from the relation between export entry costs and short-term debt (Maes et al., 2019), but we find no evidence. The general reduction on total debt ratio is in line with Greenaway and Kneller (2007) results that export firms exhibit better financial health than non-exporting firms.

Similarly, a further analysis on the effects of technological intensity within manufacturing industry reveals that high technological firms follow the opposite path on debt maturity choices,

resorting more on short-term debt in both periods.[10] Thus, these effects indicate that export and innovative firms during the different macroeconomic conditions differ on their capital structure decisions relative to their counterparts.

Table 8: Linear Combination of Interaction Terms - Internationalization

	Total Debt	**Short-Term Debt**	**Long-Term Debt**
$\boldsymbol{\beta_{export}+\beta_{crisis*export}=0}$	-0.0036***	-0.0038***	0.00019
$\boldsymbol{\beta_{export}+\beta_{postcrisis*export}=0}$	-0.0088***	0.0043**	-0.0132***

Notes: The table shows the impact of internationalization in each period for the different debt maturities. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Table 9: Linear Combination of Interaction Terms - Innovation

	Total Debt	**Short-Term Debt**	**Long-Term Debt**
$\boldsymbol{\beta_{innovation}+\beta_{crisis*innovation}=0}$	0.000989	0.019093**	-0.018103**
$\boldsymbol{\beta_{innovation}+\beta_{post\ crisis*innovation}=0}$	-0.005005	0.0110907**	-0.027067***

Notes: The table shows the impact of innovation in each period for the different debt maturities. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

5.3 Age Classes

From the differences descripted in our summary statistics and considering that firm age is an important assessment factor on credit access, we decide to explore how different were the capital structure decisions across a firm life cycle.

Thus, to capture its impact on different macroeconomic scenarios, we add to our general approach, the age class variable, and its interaction with dummies periods (Table C4 in the Appendix). Our findings and linear combination of interaction terms, Table 12, show us that most of the relations of age classes across periods are statistically significant at 1% level.

From our results, we see that young firms are the ones that diverge from the remaining age classes, since the gap of total debt increases over the all period, with more intensity during the crisis. In fact, those firms with less than five years have a positive impact on debt of both maturities during the crisis. While in a post-crisis period, the impact in short-term ratio is

[10] The linear combination of interaction terms for total debt regression does not have statistical significance.

smaller and turns negative (despite not being statistically significant) for debt of longer maturity.

The positive effect of firms with less than 5 years on debt ratios, demonstrate how young firms are more debt dependent and present additional difficulties to adapt their capital structure under adverse macroeconomic conditions in comparison to older ones. The remaining age classes follow the paths unveiled on general approach analysis reducing the gap across all period, particularly during the crisis and through reductions on debt of lower maturity.

Table 10: Linear Combination of Interaction Terms – Age Classes

	Total Debt	**Short-Term Debt**	**Long-Term Debt**
$\beta_{<5years}+\beta_{crisis*<5years}=0$	0.0244***	0.0211***	0.0033**
$\beta_{<5years}+\beta_{postcrisis*<5years}=0$	0.0199***	0.0201***	-0.0002
$\beta_{10-20years}+\beta_{crisis*10-20years}=0$	-0.0206***	-0.0234***	0.0027**
$\beta_{10-20\ years}+\beta_{postcrisis*10-20years}=0$	-0.0410***	-0.0496***	0.0085***
$\beta_{+20years}+\beta_{crisis*+20\ years}=0$	-0.0360***	-0.0384***	0.00241
$\beta_{+20\ years}+\beta_{postcrisis*+20\ years}=0$	-0.0473***	-0.0637***	0.0163***

Notes: The table shows the impact of age classes in each period for the different debt maturities. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

5.4 High and Low Leveraged Firms: Quantile Approach

We dedicate the last section to assess the evolution of the capital structure determinants across the different quantiles of the leverage ratios distribution. The findings indicate that while the signs of coefficients remain constant, the magnitudes do not (Appendix Table C5 to C7). In general, the determinants with a positive relation decrease in magnitude from lower to higher leverage firms, while the negative ones follow the opposite path. Additionally, we see that the magnitude of both period dummies decreased across the quantile distribution. Further analysis reveals that, in both periods, the firms at 90th quantile, reduced less their short-term debt and increase less their long-term debt, relative to the ones at 50th and 75th quantile, but the opposite to the firms at the first quantile, the conclusion remains the same if we do not consider the younger firms. This result allows us to conclude, that even with more pressure, higher leverage firms, are more debt dependent and have higher difficulties to reduce their leverage.

Nonetheless, in an analysis distinguishing between high and low leverage firms, based on the mean leverage by industry before the crisis, we conclude that high leveraged firms have higher reductions in total and short-term ratios and a lower increase in long-term leverage (Appendix – Table C8). These results seem to point out, that intra-industry effects are relevant, as high leverage firms were under more pressure to control their debt ratios relative to low leverage firms in the same industry.

6 Final Remarks

This paper investigates the capital structure determinants and the effects of financial crisis on capital structure decisions of Portuguese SMEs, further exploring heterogenous effects.

By making use of firm-level data from 2006 to 2018, we determine that SMEs reduced total leverage ratio during and after the financial crisis, but with more intensity in a post-crisis period. Further analysis decomposing debt maturity shows that short-term debt decreased, being only partially replaced by long-term debt. We also provide evidence that pecking order theory better explains capital structure decisions, as older and riskier firms rely less on debt, profitable firms prefer internal funds to external funds and firms with high growth opportunities tend to have more debt needs. Our results also indicate that some capital structure determinants are responsive to the adverse macroeconomic conditions, with some determinants changing their relations with debt on the crisis period. For instance, older firms with more growth opportunities do not generate enough internal funds and end up relying more on long term debt while for the remaining periods we verify the opposite.

We also contribute to the literature by exploring the impacts of firm heterogeneity and macroeconomic conditions on capital structure decisions of Portuguese SMEs.

Our findings reveal that younger firms are the ones with higher debt ratio and with less significant reductions, mainly explained by large increases on long-term debt during financial

crisis. We show that only the firms with less than five years increase the gap of total debt in both periods, which illustrates how these firms have more difficulties to adapt their capital structure decisions and reveal more barriers on access to external financing.

The export and innovative status are also factors that influence capital structure decisions. In respect to high technological firms within the manufacturing industry, the short-term debt is the component that increases during the period under analysis, contrarily to the verified on the general approach. For international firms, the substitution effect of short-term by long-term debt, just takes place on the post crisis once the opposite happens during the adverse macroeconomic scenario.

In a final analysis, we show that firms with a leverage ratio above the industry mean before the crisis have higher reductions in total and short-term ratios and a lower increase in long-term leverage. This result reveals a within sector effect, completing our result of no inter-industry effect and disputing our conclusion of lower reduction for higher indebted firms from our quantile analysis.

Overall, we confirm that Portuguese SMEs adapt their capital structure decisions considering the economic-cycle, and we show how different groups behaved on these adjustment process. These results are relevant for financial institutions and policy makers as from our analysis, we demonstrate that credit conditions and potential policies to support financing of SMEs during an adverse macroeconomic scenario need to account for the different needs and heterogenous patterns of adjustment.

Nevertheless, our study presents some limitations, namely some of the proxies employed may raise discussion and we do not consider the diversification of finance sources within each debt maturity. Future Research should extend this analysis for other countries and explore country-specific factors and consider the impacts by alternative funding sources.

References:

Abor, Joshua, and Nicholas Biekpe. 2009. "How Do We Explain the Capital Structure of SMEs in Sub-Saharan Africa? Evidence from Ghana." *Journal of Economic Studies* 36 (1): 83–97. https://doi.org/10.1108/01443580910923812.

Albaity, Mohamed Shikh, and Arison Ho Sel Chuan. 2013. "Internationalization and Capital Structure: Evidence from Malaysian Manufacturing Firms." *Asian Journal of Finance & Accounting* 5 (2): 329. https://doi.org/10.5296/ajfa.v5i2.4533.

Balios, D., N. Daskalakis, N. Eriotis, and D. Vasiliou. 2016. "SMEs Capital Structure Determinants during Severe Economic Crisis: The Case of Greece." *Cogent Economics and Finance* 4 (1): 1–11. https://doi.org/10.1080/23322039.2016.1145535.

Banco, de Portugal. 2016. "Sectoral Analysis of Non-Financial Corporations in Portugal 2011-2016." *Central Balance Sheet Studies*. Vol. 26.

Banco, de Portugal 2019. 2018. "Economic Bulletin - The Portuguese Economy in 2018." *ECB Economic Bulletin*.

Beck, Thorsten, and Asli Demirguc-Kunt. 2006. "Small and Medium-Size Enterprises: Access to Finance as a Growth Constraint." *Journal of Banking and Finance* 30 (11): 2931–43. https://doi.org/10.1016/j.jbankfin.2006.05.009.

Beck, Thorsten, Asli Demirgüç-Kunt, and Vojislav Maksimovic. 2008. "Financing Patterns around the World: Are Small Firms Different?" *Journal of Financial Economics* 89 (3): 467–87. https://doi.org/10.1016/j.jfineco.2007.10.005.

Braguinsky, Serguey, Lee G. Branstetter, and Andre Regateiro. 2011. "The Incredible Shrinking Portuguese Firm." *NBER Working Paper Series*.

Casey, Eddie, and Conor M. O'Toole. 2014. "Bank Lending Constraints, Trade Credit and Alternative Financing during the Financial Crisis: Evidence from European SMEs." *Journal of Corporate Finance* 27: 173–93. https://doi.org/10.1016/j.jcorpfin.2014.05.001.

Chen, Chiung Jung, and Chwo Ming Joseph Yu. 2011. "FDI, Export, and Capital Structure." *Management International Review* 51 (3): 295–320. https://doi.org/10.1007/s11575-011-0077-0.

D'Amato, Antonio. 2019. "Capital Structure, Debt Maturity, and Financial Crisis: Empirical Evidence from SMEs." *Small Business Economics* 55 (4): 919–41. https://doi.org/10.1007/s11187-019-00165-6.

DeAngelo, Harry, and Ronald W. Masulis. 1980. "Optimal Capital Structure Under Corporate and Personal Taxation." *Journal of Financial Economics* 8: 3–29.

Degryse, Hans, Peter de Goeij, and Peter Kappert. 2012. "The Impact of Firm and Industry Characteristics on Small Firms' Capital Structure." *Small Business Economics* 38 (4): 431–47. https://doi.org/10.1007/s11187-010-9281-8.

Demirgüç-Kunt, Asli, Maria Soledad Martinez Peria, and Thierry Tressel. 2019. "The Global Financial Crisis and the Capital Structure of Firms: Was the Impact More Severe among SMEs and Non-Listed Firms?" *Journal of Corporate Finance* 60 (September 2019): 101514. https://doi.org/10.1016/j.jcorpfin.2019.101514.

Estudos da Central de Balanços. 2019. *Análise Setorial Das Sociedades Não Financeiras Em Portugal 2018*. *Estudos Da Central de Balanços*.

Félix, Sónia. 2018. "Borrowing Constraints and Firm Dynamics." *Economic Bulletin and Financial Stability Report Articles and Banco de Portugal Economic Studies*.

Greenaway, David, and Richard Kneller. 2007. "Firm Heterogeneity , Exporting and Foreign Direct Investment." *The Economic Journal* 117 (517): 134–61.

Hall, Graham C., Patrick J. Hutchinson, and Nicos Michaelas. 2004. "Determinants of the Capital Structures of European SMEs." *Journal of Business Finance and Accounting* 31 (5–6): 711–28. https://doi.org/10.1111/j.0306-686X.2004.00554.x.

Herwadkar, Snehal S. 2017. "Corporate Leverage in EMEs: Did the Global Financial Crisis Change the Determinants?" *BIS Working Papers*, no. 681.

Instituto Nacional de Estatística. 2020. *Empresas Em Portugal 2018*. *Instituto Nacional de Estatística, I.P.* Vol. 53.

International Monetary Fund. European Department. 2018. "Portugal: 2018 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Portugal;" *Country Report No. 18/273*.

Jensen, Michael C., and William H. Meckling. 1976. "Theory of the Firm: Managerial Behavior Agency Costs and Ownership Structure." *Journal of Financial Economics* 3: 11–25.

Kane, Alex, Alan J Marcus, and Robert L Mcdonald. 1984. "How Big Is the Tax Advantage to Debt?" *The Journal of Finance* 39 (3): 841–53. https://www.jstor.org/stable/2327948.

Kenourgios, Dimitris, Georgios A. Savvakis, and Theofanis Papageorgiou. 2019. "The Capital Structure Dynamics of European Listed SMEs." *Journal of Small Business and Entrepreneurship* 32 (6): 567–84. https://doi.org/10.1080/08276331.2019.1603946.

Kumar, Satish, Sisira Colombage, and Purnima Rao. 2017. "Research on Capital Structure Determinants: A Review and Future Directions." *International Journal of Managerial Finance* 13 (2): 106–32. https://doi.org/10.1108/IJMF-09-2014-0135.

Lawless, Martina, Brian O'Connell, and Conor O'Toole. 2015. "Financial Structure and Diversification of European Firms." *Applied Economics* 47 (23): 2379–98. https://doi.org/10.1080/00036846.2015.1005829.

Leland, Hayne E, and David H Pyle. 1977. "Informational Asymmetries , Financial Structure , and Financial Intermediation" 32 (2): 371–87. https://www.jstor.org/stable/2326770.

Lisboa, Inês. 2017. "Capital Strucutre of Exporter SMEs During The Financial Crisis: Evidence From Portugal." *European Journal of Management Studies* 22 (I): 25–49.

López-Gracia, José, and Francisco Sogorb-Mira. 2008. “Testing Trade-off and Pecking Order Theories Financing SMEs.” *Small Business Economics* 31 (2): 117–36. https://doi.org/10.1007/s11187-007-9088-4.

Maes, Elisabeth, Nico Dewaelheyns, Catherine Fuss, and Cynthia Van Hulle. 2019. “The Impact of Exporting on Financial Debt Choices of SMEs.” *Journal of Business Research* 102 (August 2017): 56–73. https://doi.org/10.1016/j.jbusres.2019.05.008.

Matias, Fernanda, and Zélia Serrasqueiro. 2017. “Are There Reliable Determinant Factors of Capital Structure Decisions? Empirical Study of SMEs in Different Regions of Portugal.” *Research in International Business and Finance* 40: 19–33. https://doi.org/10.1016/j.ribaf.2016.09.014.

Matos, Paulo, and Pedro Neves. 2020. “The Determinants of Total Factor Productivity in the Portuguese Quaternary Sector.” *Gabinete de Estratégia e Estudos Do Ministério Da Economia* 0149.

Michaelas, Nicos, Francis Chittenden, and Panikkos Poutziouris. 1999. “Financial Policy and Capital Structure Choice in U.K. SMEs: Empirical Evidence from Company Panel Data.” *Small Business Economics* 12 (2): 113–30. https://doi.org/10.1023/A:1008010724051.

Migliori, Stefania, Fabrizio Maturo, and Francesco Paolone. 2018. “Capital Structure Determinants in Family Firms: An Empirical Analysis in Context of Crisis.” *International Business Research* 11 (4): 65. https://doi.org/10.5539/ibr.v11n4p65.

Modigliani, Franco, and Merton H. Miller. 1963. “Corporate Income Taxes and the Cost of Capital : A Correction.” *The American Economic Review* 53 (3): 433–43.

Modigliani, Franco, and Merton H Miller. 1958. “The Cost of Capital, Corporation Finance and the Theory of Investment” 48 (3): 261–97.

Muller, Patrice, Nicholas Robin, Jonathan Schroder, Hannah Braun, Lisa Sophie Becker, Johannes Farrenkopf, Sarah Caboz, et al. 2019. “Annual Report on European SMEs.” *European Union*. https://doi.org/10.2826/603707.

Musso, Patrick, and Stefano Schiavo. 2008. “The Impact of Financial Constraints on Firm Survival and Growth.” *Journal of Evolutionary Economics* 18 (2): 135–49. https://doi.org/10.1007/s00191-007-0087-z.

Myers, Stewart C. 1976. “Determinants of Corporate Borrowing.” *Journal of Financial Economics* 5 (2): 147–75. https://www.sciencedirect.com/science/article/pii/0304405X77900150.

———. 1984. “Capital Structure Puzzle.” *NBER Working Paper Series* 39 (9): 574–92. https://doi.org/10.1111/j.1540-6261.1984.tb03646.x.

Myers, Stewart C., and Nicholas S. Majluf. 1984. “Corporate Financing and Investment Decisions When Firms Have Information The Investors Do Not Have.” *NBER Working Paper Series* 1396 (38): 3295–96. https://doi.org/10.1016/S0040-4039(00)91429-1.

OECD. 2017. “Enhancing the Contributions of SMEs in a Global and Digitalised Economy.”

Meeting of the OECD Council at Ministerial Level, no. 1: 7–8. https://www.oecd.org/mcm/documents/C-MIN-2017-8-EN.pdf.

Pacheco, L., and F. Tavares. 2015. "Capital Structure Determinants of Portuguese Footwear Sector SMEs: Empirical Evidence Using a Panel Data." *Tékhne* 13 (2): 145–57. https://doi.org/10.1016/j.tekhne.2016.04.002.

Palacín-Sánchez, María José, Luis M. Ramírez-Herrera, and Filippo di Pietro. 2013. "Capital Structure of SMEs in Spanish Regions." *Small Business Economics* 41 (2): 503–19. https://doi.org/10.1007/s11187-012-9439-7.

Pinto, João M., and Cátia S. Silva. 2019. "Does Export Intensity Affect Corporate Leverage? Evidence from Portuguese SMEs." *Finance Research Letters*, no. March: 101418. https://doi.org/10.1016/j.frl.2019.101418.

Proença, Pedro, Raul M.S. Laureano, and Luis M.S. Laureano. 2014. "Determinants of Capital Structure and the 2008 Financial Crisis: Evidence from Portuguese SMEs." *Procedia - Social and Behavioral Sciences* 150: 182–91. https://doi.org/10.1016/j.sbspro.2014.09.027.

Robichek, Alexander A., and Stewart C. Myers. 1966. "Problems in the Theory of Optimal Capital Structure." *The Journal of Financial and Quantitative Analysis* 1 (2): 1–35.

Ross, Stephen A. 1977. "The Determination of Financial Structure: The Incentive-Signalling Approach." *The Bell Journal of Economics* 8 (1): 23–40. https://www.jstor.org/stable/3003485.

Serrasqueiro, Zélia, Nunes, and Paulo Maçãs. 2014. "Financing Behaviour of Portuguese SMEs in Hotel Industry." *International Journal of Hospitality Management* 43: 98–107. https://doi.org/10.1016/j.ijhm.2014.09.001.

Serrasqueiro, Zélia, and Paulo Maçãs Nunes. 2012. "Is Age a Determinant of SMEs' Financing Decisions? Empirical Evidence Using Panel Data Models." *Entrepreneurship: Theory and Practice* 36 (4): 627–54. https://doi.org/10.1111/j.1540-6520.2010.00433.x.

Sogorb-Mira, Francisco. 2005. "How SME Uniqueness Affects Capital Structure: Evidence from a 1994-1998 Spanish Data Panel." *Small Business Economics* 25 (5): 447–57. https://doi.org/10.1007/s11187-004-6486-8.

Yazdanfar, Darush, Peter Öhman, and Saeid Homayoun. 2019. "Financial Crisis and SME Capital Structure: Swedish Empirical Evidence." *Journal of Economic Studies* 46 (4): 925–41. https://doi.org/10.1108/JES-04-2018-0147.

Appendix A – Data

A.1 Description Of Conditions And Summary Table With The Number Of Lost Observations And Firms

To ensure the consistency of reporting we imposed the following conditions:

1. Firms in the financial, insurance and public administration / defence sector were not considered. A common procedure in the literature as these sectors due to regulatory capital requirements and /or dependency on government funding may have a different capital structure.
2. Firms with three or more years of negative equity or with two years of negative equity if they account for firms with only two observations were dismissed.
3. Fundamental accounting equation was verified. All the firms whose assets deviate over 1% of its liabilities and equity were dismissed. The error margin considered follows Matos and Neves, 2020. The same criterion was applied to verify if the sum of current and non-current assets (liabilities) were equal to total assets (liabilities).
4. Firms that at any point in time, reported zero or negative values for assets (total, tangible and current assets), liabilities (current and non-current), log of sales and expenses/reversals of depreciations and amortizations were dropped.
5. All the firms that for any given reported total assets, or equity exceeding 50 times the figure reported in the previous year and with a decrease of 20 times in the next year were dismissed.
6. All the firms with no sales over all period of register were dismissed.
7. Finally, to mitigate the impact of extreme values present in *gwtopp, profitability* and *rtd* the variables were winsorized at the 1% and 99% levels.

Table A1 Summary Table: Number Of Lost Observations And Firms

Criteria	Observations	Firms
Firms with less than two observations	80,212	80,212
An average of employees below 3	3,191,179	456,834
Firms in Liquidation conditions	122,897	171,841
Firms in the financial, insurance and public administration / defence sector	2,496	84
Firms with negative equity for three or more years	387,885	42,490
Fundamental Accounting Inequalities	2,795	267
Negative Value Variables (B001, B012, B080, B081, B029, B089, D041, D002)	17,109	1,591
Inconsistent Values over time	12,552	1,384
Sales equal to zero over all period	292,490	35,597
Growth Opportunities, Profitability, and ratio of total assets Winsorization (1% and 99%)	230,919	25,927

A.2 Variables Definition

Table A2 Variables And Their Measurement

Variable	Abbreviation	Measure
Dependent Variables		
Total Debt	RTD	Total Liabilities /Total Assets
Long-Term Debt	RLTD	Non-current Liabilities /Total Assets
Short-Term Debt	RSTD	Current Liabilities /Total Assets
Equity Ratio	REQU	Equity/Total Assets
Explanatory Variables		
Firm Age	AGE	log [Year of reference – Founding] year (cleaned)
Size (Assets)	SIZE__A	Log(assets)
Size (Sales)	SIZE_S	Log (Sales)
Size (Employees)	SIZE_E	Nº of Employees
Asset Structure	RFA	Fixed Assets / Total Assets
Profitability	RPROF	EBITDA / Total Assets
Growth Opportunities (Sales)	GWOPP_S	Annual Growth Rate of Sales
Growth Opportunities (Assets)	GWOPP_A	Annual Growth Rate of Assets
Firm Risk (Profitability deviation)	RISK_P	| Annual profitability -Average Profitability of firm *i* across all period|
Firm Risk (Interest Coverage Ratio)	RISK_ICR	Interest expenses / Earnings Before Interest and Taxes (EBIT)
Liquidity	RLIQ	Current Assets / Current Liabilities
NDTS	RDEP	Total Depreciation Expenses / Total Assets

A.3 Aggregation Of Technological Services And Manufacturing Industries

This paper considers the Eurostat aggregation of the technological intensity within the manufacturing industry and the services classified as high-tech knowledge intensive services.

Table A3 Technological Intensive Activities (Manufacturing Industry And Services)

Manufacturing Industries	**NACE Rev. 2 codes – 3-digit level**	
High-Technology	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations;
	26	Manufacture of computer, electronic and optical products
	30.3	Manufacture of air and spacecraft and related machinery
Medium-high-technology	20	Manufacture of chemicals and chemical products;
	25.4	Manufacture of weapons and ammunition
	27 to 30	Manufacture of electrical equipment; Manufacture of machinery and equipment n.e.c.; Manufacture of motor vehicles, trailers, and semi-trailers; Manufacture of other transport equipment
Services		
High-tech knowledge intensive services	59 to 63	Motion picture, video and television programme production, sound recording, and music publish activities; Programming and broadcasting activities; Telecommunications; computer programming, consultancy, and related activities; Information service activities;
	72	Scientific research and development;

A.4 Descriptive Statistics

Table A4 Mean Debt Ratios Differences Across Periods

	Mean Pre-Crisis Period	Mean Crisis Period	Mean Post-Crisis Period	Difference (Pre vs Crisis)	Difference (Crisis vs Post)
TD/TA	0.64631	0.60059	0.55256	-0.0457***	-0.0480***
STD/TA	0.52830	0.44274	0.37644	-0.0856***	-0.0663***
LTD/TA	0.11801	0.15785	0.17612	0.3984***	0.0183***

Notes: Table 4 presents in the first three columns the mean values of debt ratios calculated for each period under analysis. The test statistics presented in the last two columns measures whether the means differences between periods are statistically significant. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Table A5 Firm Characteristics Across Total Debt Ratio Distribution: Mean And Standard Deviation

	0%-25%	25%-50%	50%-75%	75%-90%	Total
TD/TA	0.2536	0.5332	0.7120	0.8830	0.5954
	(0.1111)	(0.0604)	(0.0457)	(0.0625)	(0.2445)
STD/TA	0.2026	0.3947	0.5159	0.6493	0.4388
	(0.1084)	(0.1477)	(0.1931)	(0.25)	(0.2485)
LTD/TA	0.0499	0.1380	0.1961	0.2338	0.1548
	(0.0757)	(0.1441)	(0.1911)	(0.2510)	(0.1904)
Firm Age	23.0790	19.7987	17.0621	12.5656	18.1263
	(15.1431)	(13.8850)	(13.1581)	(11.9476)	(14.1188)
Firm Size	13.2840	13.3919	13.4570	13.2402	13.3433
	(1.4473)	(1.4135)	(1.4515)	(1.3758)	(1.4159)
Asset Tangibility	0.2275	0.2587	0.2661	0.2599	0.2531
	(0.2240)	(0.2264)	(0.2295)	(0.2447)	(0.2318)
Profitability	0.0991	0.1004	0.0877	0.0566	0.0860
	(0.1055)	(0.0998)	(0.0892)	(0.0834)	(0.0537)
Firm Risk	0.0563	0.0523	0.0468	0.0466	0.0505
	(0.0578)	(0.0562)	(0.0511)	(0.0537)	(0.0549)
Growth Opportunity	0.0112	0.0401	0.06600	0.1073	0.0561
	(0.5200)	(0.5600)	(0.6353)	(0.7641)	(0.6278)
Liquidity	22.8598	207.4756	2.3954	14.6074	61.8344
	(2492.2259)	(8.43e+04)	48.1257	3693.7680	4.22e+04
NDTS	0.0355	0.0414	0.0414	0.0381	0.0391
	(0.0376)	(0.0403)	(0.0406)	(0.0410)	(0.0399)

Notes**:** Mean and standard deviation calculated across total debt ratio distribution. Standard deviation reported in parentheses.

Table A6 Number Of Export Firms By Period

Year	Nº of Firms	Nº Export	% of Export
2007	45,610	5,093	10.04%
2008	45,892	5,418	10.56%
2009	45,983	5,517	10.71%
2010	45,787	5,662	11.01%
2011	45,557	6,164	11.92%
2012	44,958	6,841	13.21%
2013	44,978	7,457	14.22%
2014	45,199	7,805	14.73%
2015	45,843	7,978	14.82%
2016	46,634	7,828	14.37%
2017	46,942	7,808	14.26%
2018	46,385	7,788	14.38%

Note: source authors calculations based on IES database and the export definition under consideration.

Figure A1 Kernel Density (High Technology Vs Low Technology Activities)

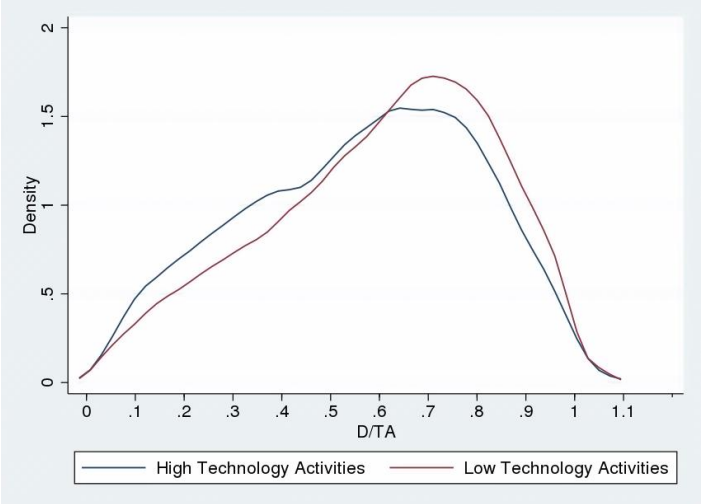


Table A7 Mean Debt Ratios Differences According To Exporter Status

	Mean Exporters	Mean Non-Exporters	Difference
TD/TA	0.5975	0.5951	-0.0023***
STD/TA	0.4385	0.4408	0.0023
LTD/TA	0.1589	0.1542	-0.0047***

Notes: Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Table A8 Mean Debt Ratios Differences According To Technological Intensity Classification

	Mean High Tech Industry	Mean Low Tech Industry	Difference	Mean High Tech Services	Mean Low Tech Services	Difference
TD/TA	0.5610	0.6011	0.0401***	0.62869	0.58703	-0.042***
STD/TA	0.4196	0.4423	0.0227***	0.49243	0.43835	-0.054***
LTD/TA	0.1414	0.1587	0.0173***	0.13626	0.14867	0.0124***

Notes: Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Appendix B – Regression Results: General Approach

Table B1 Regression Results Under Different Macroeconomic States – Total Debt Ratio

	Total Debt Ratio					
	Pre-crisis 1)		Crisis 2)		Post-crisis 3)	
	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
Firm Age	-0.138***	(0.00210)	-0.114***	(0.00222)	-0.134***	(0.00372)
Firm Size	0.143***	(0.00248)	0.109***	(0.00489)	0.109***	(0.00592)
Tangibility	0.0316***	(0.00588)	0.0284***	(0.00479)	0.0616***	(0.00562)
Profitability	-0.418***	(0.00652)	-0.352***	(0.00444)	-0.352***	(0.00494)
Firm Risk	0.00931	(0.00848)	0.0317***	(0.00693)	-0.0203**	(0.00697)
Growth Opp.	-0.0016***	(0.00047)	0.00276***	(0.000329)	0.00232***	(0.000413)
Liquidity	-4.6e-08***	(7.78e-09)	-1.22e-06***	(0.0000004)	1.78e-10	(3.21e-10)
NDTS	0.372***	(0.0190)	0.377***	(0.0159)	0.300***	(0.0262)
Constant	-0.915***	(0.0313)	-0.555***	(0.0611)	-0.532***	(0.0705)
N	151216		311908		217206	
R^2	0.283		0.179		0.190	
F	1358.05948		1184.129		978.676	

Notes: The table presents the regression results of equation (1), considering each period separately. Due to heteroskedasticity identified we used robust standard errors clustered at firm level. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Table B2 Regression Results Under Different Macroeconomic States – RSTD And RLTD

	Short-Term Debt Ratio			Long-Term Debt Ratio		
	Pre-crisis 1)	Crisis 2)	Post-crisis 3)	Pre-crisis 4)	Crisis 5)	Post-crisis 6)
Firm Age	-0.118***	-0.150***	-0.104***	-0.0199***	0.0365***	-0.0299***
	(0.00318)	(0.00232)	(0.00332)	(0.00267)	(0.00163)	(0.00257)
Firm Size	0.102***	0.0689***	0.0514***	0.0412***	0.0396***	0.0573***
	(0.00310)	(0.00410)	(0.00430)	(0.00222)	(0.00166)	(0.00273)
Tangibility	-0.139***	-0.151***	-0.153***	0.170***	0.180***	0.215***
	(0.00830)	(0.00565)	(0.00668)	(0.00716)	(0.00517)	(0.00624)
Profitability	-0.326***	-0.223***	-0.198***	-0.0919***	-0.129***	-0.153***
	(0.00851)	(0.00518)	(0.00547)	(0.00658)	(0.00412)	(0.00472)
Firm Risk	0.0274*	0.0503***	0.00516	-0.0181*	-0.0186**	-0.0255***
	(0.0111)	(0.00766)	(0.00761)	(0.00870)	(0.00587)	(0.00652)
Growth Opp.	0.00156*	0.00130**	0.00344***	-0.00315***	0.00146***	-0.00112*
	(0.000749)	(0.000495)	(0.000540)	(0.000647)	(0.000423)	(0.000495)
Liquidity	-5.46e-08**	-1.48e-06**	-8.04e-09***	8.65e-09	0.00000026	8.22e-09***
	(2.20e-08)	(0.0000006)	(1.93e-10)	(1.45e-08)	(0.0000002)	(2.63e-10)
NDTS	0.392***	0.365***	0.221***	-0.0205	0.0113	0.0786***
	(0.0267)	(0.0198)	(0.0255)	(0.0215)	(0.0164)	(0.0217)
Constant	-0.498***	-0.0568	0.0182	-0.417***	-0.498***	-0.550***
	(0.0391)	(0.0514)	(0.0516)	(0.0281)	(0.0212)	(0.0332)
N	151216	311908	217206	151216	311908	217206
R^2	0.073	0.077	0.047	0.029	0.035	0.055
F	431.049	828.957		156.376	471.984	

Notes: The table presents the regression results of equation (1), considering each period separately. Standard errors are reported in parentheses. Due to heteroskedasticity identified we used robust standard errors clustered at firm level. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Appendix C - Additional Regressions: Asymmetric Effects of Financial Crisis

C.1 Industry Regressions

Table C1 Regression Results By Industry

	Total Debt Ratio		Short-Term Debt Ratio		Long-Term Debt Ratio	
	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
Panel A: Construction Industry						
Age (log)	-0.0979***	0.00502	-0.128***	0.00491	0.0297***	0.00326
Size (Assets)	0.111***	0.00836	0.0753***	0.00700	0.0355***	0.00282
Tangibility	-0.0342***	0.00958	-0.171***	0.0121	0.137***	0.0112
Profitability	-0.382***	0.00902	-0.246***	0.0100	-0.136***	0.00788
Firm Risk	-0.0617***	0.0135	-0.0106	0.0146	-0.0511***	0.0109
Growth Opp.	0.000750	0.000448	0.000841	0.000648	-0.0000915	0.000575
Liquidity	-3.22e-09***	6.11e-10	-1.40e-08***	2.12e-09	1.08e-08***	1.56e-09
NDTS	0.325***	0.0334	0.271***	0.0403	0.0534	0.0340
Crisis	-0.0442***	0.00223	-0.0438***	0.00287	-0.000381	0.00245
Post-Crisis	-0.0733***	0.00388	-0.0726***	0.00436	-0.000705	0.00359
Constant	-0.509***	0.101	-0.129	0.0848	-0.380***	0.0343
N	82620		82620		82620	
R^2	0.263		0.163		0.035	
Panel B: Wholesale Retail and Trade Sector						
Age (log)	-0.106***	0.00187	-0.116***	0.00207	0.0105***	0.00164
Size (Assets)	0.0764***	0.00251	0.0475***	0.00230	0.0289***	0.00147
Tangibility	0.0864***	0.00572	-0.151***	0.00664	0.237***	0.00601
Profitability	-0.415***	0.00591	-0.293***	0.00641	-0.122***	0.00468
Firm Risk	-0.0203*	0.00790	-0.00735	0.00870	-0.0129	0.00666
Growth Opp.	0.00920***	0.000541	0.00726***	0.000732	0.00195**	0.000603
Liquidity	-0.00000103	0.000000731	-0.0000028***	0.000000827	0.00000175***	0.000000177
NDTS	0.385***	0.0238	0.499***	0.0280	-0.115***	0.0221
Crisis	-0.0330***	0.00107	-0.0559***	0.00130	0.0229***	0.00107
Post-Crisis	-0.0615***	0.00174)	-0.0892***	0.00191	0.0277***	0.00153
Constant	-0.117***	0.0314	0.215***	0.0289	-0.333***	0.0184
N	276295		276295		276295	
R^2	0.246		0.200		0.060	
Panel C: Manufacturing Industry						
Age (log)	-0.0964***	0.00257	-0.110***	0.00291	0.0136***	0.00239
Size (Assets)	0.0656***	0.00282	0.0339***	0.00265	0.0317***	0.00180
Tangibility	0.0711***	0.00697	-0.146***	0.00728	0.217***	0.00641
Profitability	-0.411***	0.00682	-0.265***	0.00719	-0.146***	0.00583
Firm Risk	-0.0296***	0.00881	-0.000319	0.00975	-0.0293***	0.00803
Growth Opp.	0.00919***	0.000567	0.00792***	0.000746	0.00127*	0.000621
Liquidity	-0.00000496	0.00000340	-0.00000656	0.00000498	0.00000160	0.00000172
NDTS	0.371***	0.0249	0.427***	0.0277	-0.0561*	0.0234
Crisis	-0.0255***	0.00135	-0.0521***	0.00163	0.0266***	0.00140
Post-Crisis	-0.0550***	0.00220	-0.0833***	0.00240	0.0283***	0.00201
Constant	-0.00215	0.0351	0.373***	0.0329	-0.375***	0.0223
N	168869		168869		168869	
R^2	0.201		0.164		0.067	

Notes: This table provided the estimation results of equation (1), considering the three industries with higher proportion of firms: construction industry, wholesale, and retail trade sector and in the manufacturing industry, respectively. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

C.2 Internationalization Regressions

Table C2 Regression Results – Internationalization

	Total Debt Ratio		Short-Term Debt Ratio		Long-Term Debt Ratio	
	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
Age (log)	-0.0977***	0.00143	-0.110***	0.00148	0.0120***	0.00114
Size (Assets)	0.0809***	0.00209	0.0438***	0.00177	0.0371***	0.000977
Tangibility	0.0659***	0.00350	-0.129***	0.00380	0.195***	0.00353
Profitability	-0.390***	0.00344	-0.252***	0.00370	-0.138***	0.00291
Firm Risk	-0.0345***	0.00489	-0.00266	0.00523	-0.0318***	0.00412
Growth Opp.	0.00533***	0.000258	0.00450***	0.000344	0.000835**	0.000301
Liquidity	-3.64e-09***	1.01e-09	-1.45e-08***	2.53e-09	1.08e-08***	1.64e-09
NDTS	0.389***	0.0127	0.439***	0.0141	-0.0498***	0.0120
Crisis	-0.0324***	0.000745	-0.0571***	0.000911	0.0247***	0.000782
Post-Crisis	-0.0610***	0.00121	-0.0910***	0.00133	0.0300***	0.00112
Export	-0.00966***	0.00185	-0.0171***	0.00228	0.00742***	0.00191
Crisis#Export	0.00599***	0.00173	0.0132***	0.00222	-0.00723***	0.00189
PostCrisis#Export	0.000821	0.00245	0.0215***	0.00278	-0.0206***	0.00226
Constant	-0.196***	0.0256	0.229***	0.0217	-0.425***	0.0121
N	680330		680330		680330	
R^2	0.214		0.169		0.060	

Notes: This table presents the estimation results of equation (1) for each debt ratio and introducing export variable and the respective interaction term with each period. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

C.3 Innovation Regressions

Table C3 Regression Results – Innovation Within Manufacturing Industry

	Total Debt Ratio		Short-Term Debt Ratio		Long-Term Debt Ratio	
	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
Age (log)	-0.0966***	0.00257	-0.1101***	0.00290	0.0135***	0.00239
Size (Assets)	0.0657***	0.00283	0.0339***	0.00264	0.0318***	0.00180
Tangibility	0.0714***	0.00697	-0.1453***	0.00728	0.217***	0.00641
Profitability	-0.411***	0.00682	-0.2651***	0.00719	-0.146***	0.00583
Firm Risk	-0.0297***	0.00881	-0.0004***	0.00974	-0.0293***	0.00803
Growth Opp.	0.00918***	0.000567	0.00791**	0.000746	0.00126*	0.000621
Liquidity	-0.00000496	0.00000339	-6.56e-06	4.98e-06	0.00000160	0.00000172
NDTS	0.372***	0.0249	0.42737***	0.02773	-0.0556*	0.0234
Innovation	0.00879	0.0102	0.02444**	0.01033	-0.0157	0.00944
Crisis	-0.0246***	0.00142	-0.0514***	0.00172	0.0269***	0.00148
Post-Crisis	-0.0534***	0.00229	-0.0829***	0.00251	0.0295***	0.00210
Crisis#Innovation	-0.00780*	0.00386	-0.0053	0.00467	-0.00245	0.00392
Post-Crisis#Innovation	-0.0138*	0.00590	-0.0024	0.00635	-0.0114*	0.00508
Constant	-0.00407	0.0351	0.3702***	0.03288	-0.374***	0.0223
N	168,869		168,869		168,869	
R^2	0.201		0.163		0.068	

Notes: This table presents the estimation results of equation (1) for each debt ratio and introducing innovation variable and the respective interaction term with each period. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

C.4 Age Classes

Table C4 Regression Results– Age Classes

	Total Debt Ratio		Short-Term Debt Ratio		Long-Term Debt Ratio	
	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
Age (log)	-0.0913***	0.00144	-0.107***	0.00162	0.0157***	0.00127
Size (Assets)	0.0793***	0.00206	0.0424***	0.00174	0.0369***	0.000973
Tangibility	0.0664***	0.00350	-0.129***	0.00379	0.195***	0.00353
Profitability	-0.393***	0.00342	-0.256***	0.00368	-0.137***	0.00291
Firm Risk	-0.0296***	0.00486	0.00338	0.00521	-0.0330***	0.00411
Growth Opp.	0.00573***	0.000258	0.00493***	0.000344	0.000798**	0.000300
Liquidity	-3.43e-09***	1.00e-09	-1.41e-08***	2.54e-09	1.07e-08***	1.66e-09
NDTS	0.358***	0.0126	0.404***	0.0140	-0.0462***	0.0120
<5 years	0.00276	0.00180	-0.00195	0.00234	0.00471*	0.00202
10-20 years	-0.0155***	0.00155	-0.0248***	0.00206	0.00924***	0.00180
+20 years	-0.0384***	0.00221	-0.0514***	0.00263	0.0130***	0.00226
Crisis	-0.0284***	0.00121	-0.0556***	0.00160	0.0272***	0.00140
Post-Crisis	-0.0391***	0.00182	-0.0596***	0.00240	0.0205***	0.00212
<5years #Crisis	0.0217***	0.00174	0.0231***	0.00231	-0.00137	0.00196
<5years# Post-Crisis	0.0171***	0.00254	0.0221***	0.00323	-0.00499	0.00282
10-20years #Crisis	-0.00516***	0.00147	0.00135	0.00193	-0.00651***	0.00169
10-20years#PostCrisis	-0.0255***	0.00204	-0.0248***	0.00264	-0.000749	0.00233
+20years #Crisis	0.00241	0.00170	0.0130***	0.00211	-0.0105***	0.00182
+20years#Post-Crisis	-0.00895***	0.00243	-0.0124***	0.00290	0.00341	0.00250
Constant	-0.180***	0.0253	0.256***	0.0216	-0.437***	0.0121
N	680330		680330		680330	
R^2	0.218		0.172		0.061	

Notes: This table presents the estimation results of equation (1) for each debt ratio and introducing age classes variable and the respective interaction term with each period. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

C.5 High and Low Leverage Firms

Table C5 Quantile Regression - RTD

	Total Debt Ratio				
	10%	25%	50%	75%	90%
Age (log)	-0.106***	-0.135***	-0.115***	-0.0800***	-0.0508***
	(0.000669)	(0.000545)	(0.000400)	(0.000328)	(0.000307)
Size (Assets)	0.0208***	0.0269***	0.0229***	0.0127***	0.00497***
	(0.000452)	(0.000369)	(0.000270)	(0.000222)	(0.000208)
Tangibility	0.0320***	0.0440***	0.0349***	0.0254***	0.0208***
	(0.00278)	(0.00227)	(0.00166)	(0.00136)	(0.00128)
Profitability	-0.338***	-0.630***	-0.802***	-0.833***	-0.806***
	(0.00689)	(0.00562)	(0.00412)	(0.00338)	(0.00317)
Firm Risk	-0.489***	-0.536***	-0.415***	-0.258***	-0.138***
	(0.0110)	(0.00895)	(0.00657)	(0.00539)	(0.00505)
Growth Opp.	0.0202***	0.0154***	0.00944***	0.00607***	0.00384***
	(0.000933)	(0.000761)	(0.000558)	(0.000458)	(0.000429)
Liquidity	8.85e-09	3.17e-09	-3.64e-09	-9.07e-09	-1.26e-08*
	(1.37e-08)	(1.12e-08)	(8.21e-09)	(6.73e-09)	(6.31e-09)
NDTS	0.796***	0.710***	0.657***	0.596***	0.594***
	(0.0185)	(0.0151)	(0.0111)	(0.00907)	(0.00850)
Crisis	-0.0516***	-0.0575***	-0.0436***	-0.0327***	-0.0248***
	(0.00151)	(0.00123)	(0.000905)	(0.000743)	(0.000696)
Post-Crisis	-0.0752***	-0.0881***	-0.0688***	-0.0474***	-0.0327***

	(0.00163)	(0.00133)	(0.000976)	(0.000801)	(0.000750)
Constant	0.333***	0.532***	0.711***	0.881***	0.986***
	(0.00606)	(0.00494)	(0.00363)	(0.00297)	(0.00279)
N	680330	680330	680330	680330	680330

Notes: This table presents the estimation results of total debt ratio from a quantile regression at 10%, 25%, 50%, 75% and 90%. Standard errors are reported in parentheses. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Table C6 Quantile Regression - RSTD

	Short-Term Debt Ratio				
	10%	25%	50%	75%	90%
Age (log)	-0.0304***	-0.0665***	-0.0982***	-0.0976***	-0.0774***
	(0.000411)	(0.000460)	(0.000456)	(0.000457)	(0.000495)
Size (Assets)	0.00883***	0.0177***	0.0204***	0.0130***	0.00561***
	(0.000278)	(0.000311)	(0.000309)	(0.000309)	(0.000335)
Tangibility	-0.113***	-0.193***	-0.256***	-0.225***	-0.137***
	(0.00171)	(0.00191)	(0.00190)	(0.00190)	(0.00206)
Profitability	0.00159	-0.219***	-0.508***	-0.715***	-0.790***
	(0.00423)	(0.00474)	(0.00470)	(0.00471)	(0.00510)
Firm Risk	-0.129***	-0.201***	-0.221***	-0.178***	-0.113***
	(0.00675)	(0.00756)	(0.00750)	(0.00750)	(0.00813)
Growth Opp.	0.00848***	0.0139***	0.0140***	0.00924***	0.00542***
	(0.000573)	(0.000642)	(0.000637)	(0.000637)	(0.000691)
Liquidity	-1.89e-07***	-6.46e-09	-1.23e-08	-1.82e-08	-2.27e-08*
	(8.43e-09)	(9.45e-09)	(9.37e-09)	(9.37e-09)	(1.02e-08)
NDTS	0.464***	0.567***	0.576***	0.547***	0.518***
	(0.0114)	(0.0127)	(0.0126)	(0.0126)	(0.0137)
Crisis	-0.0440***	-0.0730***	-0.0970***	-0.0974***	-0.0830***
	(0.000930)	(0.00104)	(0.00103)	(0.00103)	(0.00112)
Post-Crisis	-0.0718***	-0.117***	-0.153***	-0.153***	-0.126***
	(0.00100)	(0.00112)	(0.00111)	(0.00111)	(0.00121)
Constant	0.159***	0.326***	0.606***	0.879***	1.030***
	(0.00372)	(0.00417)	(0.00414)	(0.00414)	(0.00449)
N	680330	680330	680330	680330	680330

Notes: This table presents the estimation results of short-term debt ratio from a quantile regression at 10%, 25%, 50%, 75% and 90%. Standard errors are reported in parentheses. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Table C7 Quantile Regression - RLTD

	Long-Term Debt Ratio				
	10%	25%	50%	75%	90%
Age (log)	-7.54e-09***	-0.000276*	-0.0106***	-0.0351***	-0.0548***
	(9.90e-11)	(0.000137)	(0.000317)	(0.000481)	(0.000703)
Size (Assets)	5.78e-09***	0.00131***	0.00681***	0.00223***	-0.00440***
	(6.69e-11)	(0.0000929)	(0.000215)	(0.000325)	(0.000475)
Tangibility	4.05e-08***	0.0141***	0.271***	0.419***	0.376***
	(4.11e-10)	(0.000571)	(0.00132)	(0.00200)	(0.00292)
Profitability	-4.92e-08***	-0.00416**	-0.0851***	-0.337***	-0.659***
	(1.02e-09)	(0.00142)	(0.00327)	(0.00496)	(0.00724)
Firm Risk	-6.33e-08***	-0.00731**	-0.106***	-0.168***	-0.177***
	(1.63e-09)	(0.00226)	(0.00521)	(0.00790)	(0.0115)
Growth Opp.	8.43e-10***	0.000144	0.00213***	0.00245***	0.00354***
	(1.38e-10)	(0.000192)	(0.000443)	(0.000671)	(0.000981)
Liquidity	1.36e-08***	1.35e-08***	1.20e-08	8.12e-09	1.84e-09
	(2.03e-15)	(2.82e-09)	(6.51e-09)	(9.87e-09)	(1.44e-08)
NDTS	9.14e-08***	0.00327	0.0470***	0.169***	0.185***
	(2.73e-09)	(0.00380)	(0.00877)	(0.0133)	(0.0194)
Crisis	3.68e-09***	0.00310***	0.0442***	0.0553***	0.0205***
	(2.24e-10)	(0.000311)	(0.000719)	(0.00109)	(0.00159)
Post-Crisis	4.98e-09***	0.00785***	0.0706***	0.0914***	0.0612***
	(2.41e-10)	(0.000335)	(0.000775)	(0.00117)	(0.00172)
Constant	-9.40e-08***	-0.0184***	-0.0645***	0.171***	0.539***
	(8.97e-10)	(0.00125)	(0.00288)	(0.00436)	(0.00637)
N	680330	680330	680330	680330	680330

Notes: This table presents the estimation results of long-term debt ratio from a quantile regression at 10%, 25%, 50%, 75% and 90%. Standard errors are reported in parentheses. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Table C8 High and Low Leverage Firms – Industry Average Debt Level

	Total Debt Ratio		Short-Term Debt Ratio		Long-Term Debt Ratio	
	Low (1)	High (2)	Low (3)	High (4)	Low (5)	High (6)
Age (log)	-0.08668***	-0.10275***	-0.09128***	-0.12432***	0.0046***	0.02156***
	(0.0022)	(0.0017)	(0.0020)	(0.0021)	(0.0013)	(0.0018)
Size (Assets)	0.08653***	0.06658***	0.04656***	0.03358***	0.03997***	0.03297***
	(0.0034)	(0.0020)	(0.0027)	(0.00196)	(0.0013)	(0.0014)
Tangibility	0.09736***	0.03337***	-0.0889***	-0.16938***	0.18636***	0.20275***
	(0.0052)	(0.0042)	(0.0048)	(0.0056)	(0.0045)	(0.0054)
Profitability	-0.28686***	-0.49699***	-0.16982***	-0.32922***	-0.1170***	-0.16777***
	(0.0046)	(0.0047)	(0.0046)	(0.0059)	(0.0034)	(0.0050)
Firm Risk	0.02492***	-0.07026***	0.04372***	-0.02006**	-0.01880***	-0.05029***
	(0.0069)	(0.0064)	(0.0067)	(0.0081)	(0.0049)	(0.0070)
Growth Opp.	0.00609***	0.00455***	0.00510***	0.00394***	0.00099***	0.00061
	(0.0003)	(0.0003)	(0.0004)	(0.0005)	(0.0003)	(0.0004)
Liquidity	-7.65e-07***	-2.89e-09***	-7.55e-07	-1.38e-08***	-1.05e-08	1.09e-08***
	(2.86e-07)	(6.25e-10)	(5.72e-07)	(2.24e-09)	(3.04e-07)	(1.67e-09)
NDTS	0.30190***	0.45882***	0.31678***	0.53430***	-0.01488	-0.07548***
	(0.0178)	(0.0163)	(0.01720)	(0.02153)	(0.0144)	(0.0195)
Crisis	-0.00538***	-0.04796***	-0.03188***	-0.06818***	0.02650***	0.0202***
	(0.0010)	(0.0009)	(0.0010)	(0.0013)	(0.0008)	(0.00127)
Post-Crisis	-0.01429***	-0.10369***	-0.49756***	-0.12120***	0.03545***	0.01751***
	(0.0015)	(0.0015)	(0.0015)	(0.0020)	(0.0012)	(0.0018)
Constant	-0.44805***	0.14935***	0.28646	0.50849***	-0.47670***	-0.35913***
	(0.0411)	(0.0256)	(0.0331)	(0.0247)	(0.0160)	(0.01856)
N	335352	344978	335352	344978	335352	344978

R^2	0.34795	0.12990	0.23044	0.10415	0.04795	0.08254

Notes: This table presents the estimation results of equation (1) considering high (low) leveraged if a firm has an average leverage in pre-crisis subperiod below (above) the correspondent industry median. Standard errors are reported in parentheses. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Appendix D - Robustness Checks

Table D1 Regression Results For Models With Lagged Independent Variables

	Total Debt Ratio	Short-Term Debt Ratio	Long-Term Debt Ratio
Age (log)$_{(t-1)}$	-0.0810***	-0.0911***	0.0101***
	(0.00118)	(0.00137)	(0.00115)
Size (Assets) $_{(t-1)}$	0.0342***	0.00882***	0.0254***
	(0.00132)	(0.00126)	(0.000906)
Tangibility $_{(t-1)}$	0.0592***	-0.0633***	0.123***
	(0.00318)	(0.00356)	(0.00335)
Profitability $_{(t-1)}$	-0.350***	-0.240***	-0.110***
	(0.00351)	(0.00374)	(0.00304)
Firm Risk $_{(t-1)}$	-0.0260***	-0.0227***	-0.00331
	(0.00451)	(0.00502)	(0.00427)
Growth Opp. $_{(t-1)}$	0.00251***	0.00181***	0.000705*
	(0.000257)	(0.000349)	(0.000320)
Liquidity $_{(t-1)}$	-0.000000144***	-0.000000861***	0.000000717***
	(3.30e-08)	(0.000000105)	(8.00e-08)
NDTS $_{(t-1)}$	0.327***	0.434***	-0.107***
	(0.0118)	(0.0135)	(0.0117)
Crisis	-0.0281***	-0.0546***	0.0265***
	(0.000673)	(0.000861)	(0.000750)
Post-Crisis	-0.0567***	-0.0866***	0.0299***
	(0.00110)	(0.00125)	(0.00107)
Constant	0.373***	0.620***	-0.247***
	(0.0163)	(0.0156)	(0.0113)
N	614923	614923	614923
R^2	0.168	0.147	0.036

Notes: This table presents the regression results of equation (1), considering lagged independent variables by one year. Standard errors are reported in parentheses. Due to heteroskedasticity identified we used robust standard errors clustered at firm level. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively