Capital structure determinants and debt maturity during the crisis: Empirical evidence from SMEs

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Abstract

Based on a unique dataset of Italian SMEs over the period 2006-2016, we investigate how the recent global financial crisis impacted SMEs' capital structure decisions and their determinants. Our results show that credit supply shocks negatively impacted the leverage of Italian SMEs. During and after the crisis, Italian SMEs significantly decreased their leverage, particularly their short-term debt exposure, with respect to the pre-crisis period. As a result, the short-term debt channel is more sensitive to credit conditions than is the long-term debt channel. Interestingly, we also show that trade credit does not compensate for the reduction in bank credit. Finally, our findings reveal that during different macroeconomic states, the determinants of both capital structure and debt maturity exhibited significantly different effects. Specifically, during the crisis, riskier and more profitable firms reduced their leverage more than during the pre-crisis period. These findings have implications for firms and policy makers.

Keywords: Global financial crisis, capital structure, SMEs, debt maturity.

JEL classification G01, G32, G33

1 Introduction

The recent global financial crisis was the most severe economic crisis since the 1929 Great Depression. The crisis began in the US in 2007 with the bankruptcy of Lehman Brothers, and its effects have had negative consequences globally (Kahle & Stulz, 2013; Moshirian, 2011). Although this crisis originated from the financial system, because the crisis was triggered in the subprime mortgages segment, it has severely impacted the real economy, also involving businesses and consumers. Following these events, the literature on the causes and consequences of the 2008 financial crisis increased rapidly (Ivashina & Scharfstein, 2010; King & Wen, 2011; Popov & Ongena, 2011). In particular, there is considerable evidence that the disruption of markets and financial institutions following the crisis has had significant effects on the conditions and availability of bank credit (Campello, Graham, & Harvey, 2010).

Despite growing interest in the effects of the financial crisis on the real economy, particularly on businesses, analyses of the effects of the financial crisis on firms' behavior, and specifically on financial decisions (especially with reference to the firm capital structure) are still limited and primarily focused on large and listed companies (Harrison & Wisnu Widjaja, 2014; Zeitun, Temimi, & Mimouni, 2017). Furthermore, little attention has been paid to the effects of the financial crisis

on the financial behavior of small and medium-sized enterprises (SMEs) (Daskalakis, Balios, & Dalla, 2017). Although in recent years, the interest of scholars has also turned to the analysis of the capital structure of SMEs (Hall, Hutchinson, & Michaelas, 2004; López-Gracia & Sogorb-Mira, 2008; Palacín-Sánchez, Ramírez-Herrera, & di Pietro, 2013; Sogorb-Mira, 2005), this topic deserves much more scholarly attention. SMEs represent almost the entirety of enterprises globally. In the EU-28 non-financial business sector, SMEs represent approximately 99.8% of the sector. As a result, SMEs greatly contribute to increasing employment and economic development (Hope, 2017). Therefore, the present work aims to contribute to the literature by investigating whether and to what extent the recent financial crisis has impacted the determinants of SMEs' capital structure.

During economic downturns, firms are more constrained given that the credit supply is negatively affected by adverse macroeconomic conditions (Deyoung, Gron, Torna, & Winton, 2015; Ivashina & Scharfstein, 2010; Thakor, 2015). At the same time, a crisis affects the real economy so that firm's opportunities are limited, and profit volatility increases. Therefore, economic crises impact both the demand and supply of credit. On the one hand, financial institutions reduce credit offerings and increase the cost so that companies have less opportunity to obtain loans from banks. Existing works on the impact of the crisis on the financial decisions of firms show that economic decline impacts the credit supply to firms and, in turn, the firm's financing decisions. On the other hand, companies use the financial leverage with greater caution because during the crisis, asymmetry problems with external investors became more relevant and much worse (Mishkin, 1999). However, firms may need more financial resources given that a crisis negatively impacts their cash flows. Consequently, the crisis exerts mixed influences on the firms' capital structures. Therefore, the 2008 financial crisis offers a natural laboratory for exploring the impact of financial shocks on the capital structure of SMEs.

Based on a unique dataset of Italian SMEs over the period 2006-2016, we investigate how the recent global financial crisis impacted their capital structure decisions and the determinants of these decisions. Moreover, to determine which components of firm leverage are most impacted by credit shocks, we examine the effects of the crisis on debt maturity. This analysis allows us to recognize the transmission channels of credit supply shocks on firm leverage. According to pecking order predictions, our results highlight that the SMEs' capital structure is mainly driven by profitability, liquidity, asset tangibility and profit volatility. Furthermore, we show that credit supply shocks negatively impacted the leverage of Italian SMEs. During and after the crisis, Italian SMEs significantly decreased their leverage, particularly their short-term debt exposure, with respect to the pre-crisis period. As a result, we find that the short-term debt channel is more sensitive to credit conditions than is long-term debt. Interestingly, we also show that trade credit does not compensate for the reduction in bank credit (Love, Preve, & Sarria-Allende, 2007). Finally, our findings reveal that during different macroeconomic states, the effects of the determinants of both capital structure and debt maturity significantly differed. Specifically, during the crisis, profit volatility, asset tangibility and profitability demonstrated the greatest change in their impact compared to that during the pre-crisis period, such that riskier and more profitable firms reduced their leverage more than during the pre-crisis period. At the same time, firms with high tangible assets reduced their debt ratio less than during the previous period. Finally, we highlight that during the post-crisis period, capital structure and debt maturity determinants partially reverted to pre-crisis levels.

In this work, we contribute to the literature on firm financial decisions and financial crises. To the best of our knowledge, the empirical evidence on the relationship between financial crisis and the capital structure of SMEs is still limited if not absent. Therefore, our contribution is twofold. First, we expand the literature on the impact of financial crises on the determinants of capital structure and its components. Second, we focus on SMEs, which are largely ignored by the empirical literature. Therefore, our results may improve our understanding of the interaction between a financial crisis and capital structure determinants. Finally, we believe that our results can have policy implications given that financial institutions should consider the patterns of firm leverage when they project credit policies for SMEs.

The paper is structured as follows. In the next section, we present the theoretical background of our study and review the literature on the topic. Next, we present the sample and the methodology. Then, we present and discuss the results. Finally, we discuss the implications of our findings and our conclusion.

2 Theoretical background and empirical predictions

The empirical literature investigates firms' capital structure decisions on the basis of two competing theories that try to explain the mix between debt and equity. The first theory is the trade-off theory. This theory suggests the existence of an optimal mix between debt and equity that is reached when the marginal benefits and costs of an additional unit of debt are perfectly balanced (DeAngelo & Masulis, 1980; Myers, 1977). The advantages of the debt are mainly concerned with i) the tax benefit (since interests paid are deductible from corporate profit) and ii) the reduction of agency problems between owners and managers. The costs of debt include i) bankruptcy costs (since more leveraged firms are more likely to fail) and ii) agency costs derived from the conflicts between owners and creditors. The second theoretical approach to capital structure decisions is the pecking order theory (Myers, 1984; Myers & Majluf, 1984). This approach does not suggest the existence of an optimal capital structure but instead highlights a specific order of preference when firms raise new capital. According to Myers (1984), due to adverse selection problems, firms prefer to finance their investments first with internal funds and when these funds are insufficient with external resources. Among external resources, firms primarily prefer to issue new debt because of the lower information costs compared to equity before they issue new equity.
Given the characteristics of SMEs, the literature suggests that pecking order theory is particularly suitable to explain the capital structure decisions of these firms (Daskalakis & Psillaki, 2008; Hall et al., 2004). SMEs, due to their opacity, are more likely to be financially constrained and could suffer from high information costs that, in turn, could increase the cost of external resources. For these reasons, SMEs may prefer to use internal funds first because of their lower cost. When internal funds are insufficient, SMEs first issue new debt and then new equity. In fact, SMEs are managed by their owners, which prefer not to issue new equity in order to maintain their control over the firm. Therefore, debt is preferred to equity. Finally, the literature suggests that the debt tax benefit might have no relevance for SMEs because they do not generate high profits (Pettit & Singer, 1985). Although the pecking order theory seems to better explain the capital structure of SMEs, the empirical literature on SMEs' capital structure uses both the trade-off theory (López-Gracia & Sogorb-Mira, 2008; Sogorb-Mira, 2005) and the pecking order theory (Daskalakis & Psillaki, 2008; Hall et al., 2004; Palacín-Sánchez et al., 2013). Therefore, we use a multi-theoretical approach since capital structure decisions can be explained from different points of view (Shyam-Sunder & Myers, 1999).

2.1 Empirical predictions

To test the predictions of the pecking order and the trade-off theory, the empirical literature suggests investigating the impact of specific firm-level variables as proxies of the two competing theories on firm indebtedness. Consistent with the current literature on capital structure, in this work, we used firm size and age, asset structure, firm profitability, profit volatility, growth opportunities and liquidity. Finally, to test the trade-off theory in SMEs, we also included a tax-related variable, namely, non-debt tax shields.

Firm size. Scholars suggest that large firms face low bankruptcy risk because they are more diversified and have more stable profits and cash flows than do SMEs (Rajan & Zingales, 1995). Therefore, bankruptcy costs for large firms are lower than for small firms (Warner, 1977). Consequently, trade-off theorists posit that large firms are incentivized to increase their leverage

(Frank & Goyal, 2003). Therefore, a positive relation between firm size and leverage is predicted. Conversely, from the pecking order perspective, firm size is a proxy of information asymmetry problems between firms and external investors. Larger firms pose more information problems because they are more complex than small firms. Therefore, large firms are expected to face high information asymmetry costs when they raise external financing. As a result, a negative relation between firm size and leverage is expected. However, the empirical literature widely supports the positive relation between firm size and leverage (Fama & French, 2002; Hall et al., 2004; López-Gracia & Sogorb-Mira, 2008; Michaelas, Chittenden, & Poutziouris, 1999; Sogorb-Mira, 2005). Thus, a positive impact of firm size on leverage is expected. Despite this expectation, the relation between firm size and leverage could be specified differently with reference to debt maturity (Hall et al., 2004; Michaelas et al., 1999; Sogorb-Mira, 2005). Since small firms bear high bankruptcy risk because of their high profit volatility, their access to long-term lending could be severely constrained. Therefore, it is expected that while large firms have a great proportion of long-term debt, SMEs use more short-term debt. Consequently, firm size positively impacts long-term debt but negatively affects short-term debt.

Firm age. According to the trade-off theory, older firms have more visibility on the market, their competitive position is more stable, and they pose less serious information asymmetry problems to external investors. Therefore, older firms have a lower bankruptcy probability than do younger firms. As a result, a positive relation between firm age and leverage is expected. However, pecking order theorists suggest an inverse relation between firm age and leverage because older firms have had time to accumulate funds and, hence, they have less need of external resources. The empirical literature highlights results consistent with pecking order theory (Helwege & Liang, 1996; López-Gracia & Sogorb-Mira, 2008; mac an Bhaird & Lucey, 2010; Michaelas et al., 1999). A negative association is also expected between age and both long-term and short-term debt.

Asset structure. From the trade-off perspective, tangible assets could be used as collateral and, hence, firms with high tangible assets have low bankruptcy costs (Harris & Raviv, 1991; Myers, 1977; Rajan & Zingales, 1995; Titman & Wessels, 1988). As a result, an increase in fixed assets is suggested to lead to high firm leverage. Conversely, pecking order theorists suggest that high tangible assets are associated with low information asymmetries because external investors could easily value these assets. Consequently, firms with high amounts of tangible assets could issue equity capital at lower costs (Frank & Goyal, 2003; Harris & Raviv, 1991). Thus, a negative association between tangible assets and firm leverage is expected. However, these predictions have to be specified in relation to the debt maturity. Based on the matching principle, firms have to match the maturity of their liabilities to that of their assets (Myers, 1977; Stohs & Mauer, 1996). Therefore, it is expected that tangible assets are positively (negatively) associated with long-term debts (short-term debts).

Profitability. Trade-off theorists highlight that profitable firms are incentivized to increase their debts for two main reasons. First, profitable firms are less risky and, hence, face low bankruptcy costs. Second, firms with high profits can benefit from the debt tax shields with a reduction of the tax burden on profits. In contrast, the pecking order theory predicts a negative association between profitability and leverage because more profitable firms, *ceteris paribus*, will borrow less given that they are able to generate funds internally (Fama & French, 2002; Rajan & Zingales, 1995). The empirical literature also widely confirms the pecking order perspective in the context of SMEs (Antoniou, Guney, & Paudyal, 2008; Baskin, 1989a; Fama & French, 2002; Hall et al., 2004; Sogorb-Mira, 2005). Moreover, a negative association is reported between profitability and both long- and short-term debt (Hall et al., 2004; Palacín-Sánchez et al., 2013).

Risk. Given that firms with high profit volatility are more likely to fail, trade-off theory predicts a negative relation between risk and leverage (Fama & French, 2002; Frank & Goyal, 2009; Harris & Raviv, 1991). Additionally, the pecking order theory suggests that risky firms are less leveraged to reduce the probability of issuing new risky securities or foregoing investments with positive net present value (Fama & French, 2002). Moreover, these predictions are also valid for SMEs. The pecking order perspective assumes that firms can access the public debt market. However, given that SMEs are usually characterized by volatile cash flows, insufficiently tangible asset and information opacity, they are not able to access the public debt market. As a result, an increase in profit volatility leads to less leverage (Lemmon & Zender, 2010; Myers, 1984). The empirical literature is consistent with these theoretical considerations (Bancel & Mittoo, 2004; Frank & Goyal, 2009; Harris & Raviv, 1991; Zeitun et al., 2017).

Growth opportunities. According to the trade-off literature, high-growth firms are associated with greater bankruptcy risk (Baskin, 1989b; Harris & Raviv, 1991; Myers, 1977, 1984). Consequently, firms with high growth opportunities should be less leveraged. Conversely, pecking order theory would suggest a positive sign for this variable because higher growth is associated with greater asymmetric information problems. As a result, high-growth firms increase their leverage because they face greater difficulties in issuing new equity capital and overcoming the limits of internal resources (Frank & Goyal, 2009). The empirical evidence on SMEs is consistent with the pecking order hypothesis (Degryse, de Goeij, & Kappert, 2012; Michaelas et al., 1999; Palacín-Sánchez et al., 2013; Sogorb-Mira, 2005).
According to Myers (1977), high-growth firms have incentives to engage in opportunistic behaviors. Therefore, while credit suppliers will reduce long-term funds, firms could use short-term debt to mitigate the long-term credit reduction by financial institutions. Consequently, as suggested by Myers (1977), we should expect a positive relation between growth opportunities and short-term debt and a negative relation with long-term debt. However, the empirical literature on SMEs does not report consistent evidence on these relations (Hall et al., 2004; Michaelas et al., 1999; Palacín-Sánchez et al., 2013; Sogorb-Mira, 2005).

Liquidity. Firms with more liquid assets are less likely to face bankruptcy, at least in the short term. Therefore, they experience low bankruptcy costs, and hence, they could increase their leverage (de Jong, Kabir, & Nguyen, 2008). From the pecking order perspective, more liquid assets are associated with low leverage because firms can use these internal funds to finance their business opportunities. The empirical evidence on this relation is not conclusive, reporting mixed results (Fan, Titman, & Twite, 2012; Ozkan, 2001; Öztekin, 2015). However, liquidity could impact debt maturity differently. The literature suggests that long-term lenders are exposed to the risk that the borrowers' conditions could deteriorate over time. Moreover, borrowers can use credit to finance too risky projects. Therefore, to control such risks, liquidity could represent a guarantee for long-term lenders. Consequently, firms could decide to remain liquid to improve their long-term credit capacity (Antoniou, Guney, & Paudyal, 2003; Schiantarelli & Srivastava, 1997). As a result, high liquid assets are positively related to long-term debt.

Finally, concerning the non-debt tax shields, a negative relationship with corporate leverage is predicted. From the trade-off perspective, firms use debt to save on corporate tax. However, as suggested by DeAngelo & Masulis (1980), a firm may use depreciation and/or amortization as a substitute for the interest expenses to reduce corporate taxation. Therefore, non-debt tax benefits reduce the appeal of the debt tax shields and hence negatively affect corporate financial leverage. We highlight that, for SMEs, this variable could represent the main alternative to reducing tax burdens since these firms probably do not use debt for tax shields given their low profitability.

2.2 Financial crisis and its impact on firms' capital structure

A large body of literature investigates the cause and the consequences of the financial crisis on the real economy. Specifically, a number of papers analyze the impact of the crisis on credit channels. Although there are no conclusive results, the most common narrative of the crisis suggests that the crisis had a negative impact on the supply of credit, an increase in the cost of loans and, consequently, a reduction in corporate investments. Ivashina & Scharfstein (2010) found that during the financial crisis, lending to firms decreased sharply. The authors also showed that banks with less access to deposit financing decreased their lending more than other banks did. Moreover, Santos (2011) analyzed a sample of 6,526 loans between 2002 and 2008 and highlighted that firms paid higher loan spreads during the financial crisis and that the increase in loan spreads was higher for firms that borrowed from banks that incurred greater losses. As the crisis increased financial constraints, companies have changed their strategies, reducing or postponing planned investments. Duchin, Ozbas, & Sensoy (2010) showed that US firms decreased their investments and that this decline was greater for bank-dependent firms. Campello, Graham, & Harvey (2010), in a cross-country study, surveyed 1,050 CFOs and found that because of financial constraints during the crisis, firms cancelled or postponed their investments. In the same sense, Vermoesen, Deloof, & Laveren (2013) analyzed a sample of Belgian firms during the crisis and found that financially constrained firms are more likely to experience a larger decrease in their investments. To sum up, the evidence reported above suggests that during a crisis, significant supply credit constraints exist that impact firms' investment decisions.

However, while this evidence seems to be consistent with the description of the crisis reported above, there is also evidence that contrasts with this picture of the crisis. Chari, Christiano, & Kehoe (2008) showed that the crisis is not associated with a decline in bank lending. Kahle & Stulz (2013) investigated a sample of US firms and highlighted that while debt issuance fell after September 2008, net equity issuance did not increase during the crisis until April 2009. Therefore, there was no substitution effect between debt and equity. Furthermore, the authors found that the credit supply shock did not lead to a reduction in firm investments. Moreover, over the whole crisis period, firms increased their cash holdings significantly.

Regarding the effects of economic turmoil on SMEs, it has been suggested that these firms are more vulnerable to credit rationing. Since they have limited access to the capital markets, SMEs face greater difficulty in raising external resources. Cowling, Liu, & Ledger (2012) analyzed a sample of SMEs located in UK and found that credit was more readily available to larger and older firms throughout the recession. Additionally, Carbó-Valverde, Rodríguez-Fernández, & Udell (2016) showed that during a credit crunch, SMEs were more adversely affected. Vermoesen, Deloof, & Laveren (2013) showed that during a financial crisis, SMEs are less able to finance new investments because the credit crunch weakens their access to external resources.

While a large body of literature exists on the effects of the financial crisis on credit availability for SMEs, studies on the impact of the crisis on the capital structure of SMEs are still limited (Daskalakis et al., 2017). Harrison & Wisnu Widjaja (2014) analyzed a sample of US firms to explore the effect of the crisis on the capital structure's determinants. They found that the impact of asset tangibility and profitability on capital structure changed during the crisis. Zeitun, Temimi, & Mimouni (2017) examined a sample of listed firms and showed that the effect of growth opportunities on leverage became positive after the crisis, the effect of firm risk became insignificant and the firm size became more significant after the crisis. Finally, Akbar, Rehman, & Ormrod (2013) analyzed a sample of private firms in the UK and found that the crisis affected certain capital structure determinants.

In conclusion, while consistent evidence shows that the crisis affected lending behavior and firm financial decisions, more empirical work is still needed to understand the effects of the crisis on the determinants of the SMEs' capital structure.

3. Research design: Sample, variables and estimation framework

This is the first work that analyze capital structure determinants on a sample of Italian SMEs. In the European Union economy, SMEs account for 99.8% of the non-financial firms and employ 67% of the total employees (European Commission, 2017). Italy has one of the largest segments of SMEs. Although many other countries have a large number of SMEs, Italy is one of the largest economies in the world where 98% of the firms are micro-firms (ISTAT, 2013).
Italy is particularly interesting because of the severe impacts that the global financial crisis has produced on Italian firms. Specifically, given the relevance of the manufacturing sector for the Italian economy, Italy has suffered a great recession due to the rapid and severe contraction in global trade. As a result, in 2009, the Italian GDP decreased sharply by approximately 6%. However, in addition to the effects of the subprime crisis that started in late 2007 in the US, Italy also suffered from the sovereign debt crisis and the consequent banking crisis that began in 2011 and hit many European countries (Spain, Portugal, Greece). In this scenario, despite the relevant expansive monetary intervention of the European Central Bank, Italian firms were severely constrained in their access to banking credit (Bofondi, Carpinelli, & Sette, 2017).

3.1 Sample and data collection

In this study, we used a panel approach to investigate a sample of Italian non-financial SMEs during the period 2006-2016. While there are various definitions of SMEs in the literature (Hall et al., 2004; Jordan, Lowe, & Taylor, 1998; Scherr & Hulburt, 2001), we identify SMEs in line with the EU Commission Recommendation No. 2003/361, which defines SMEs as firms with fewer than 250 employees and annual turnover below or equal to 50 million EUR and/or balance sheet total below or equal to 43 million euros.
We randomly selected our sample of Italian SMEs from the AIDA database of the Bureau Van Dijk. This database contains information and balance sheet data on approximately 500,000 Italian companies. We selected non-financial firms (we excluded firms operating in financial, insurance and real estate industries) with fewer than 250 employees, with annual turnover below or equal to 50 million EUR and with balance sheet total less than or equal to 43 million euros. Moreover, we included only joint-stock and limited companies to ensure highly reliable accounting data and to increase the comparability of financial data among the sampled firms. Accounting standards for partnerships and sole proprietorships could present exceptions or simplifications that could reduce the comparability. Furthermore, we considered only firms with available information for the period under investigation. Finally, we excluded firms that were in liquidation and/or under a bankruptcy procedure and, consequently, firms with equity less than or equal to zero. As a result, our final sample consisted of 14,500 Italian SMEs during the period 2006-2016 and covers all economic sectors (except finance and insurance). For the sampled firms, we collected data from annual financial statements. Specifically, we used the AIDA database to collect financial information. The data collection returned a strongly balanced panel of 159,500 observations. To the best of our knowledge, the dataset we collected is the most comprehensive on Italian SMEs and is the first to explore the capital structure of Italian SMEs during and after the crisis.

3.2 Variables

Concerning the variables used in this study, we proxied the financial leverage, our dependent variable, with the ratio between total debt and total assets (D/TA) (Daskalakis et al., 2017; Hall et al., 2004; Palacín-Sánchez et al., 2013; Sogorb-Mira, 2005). Moreover, to analyze the impact of the financial crisis on debt maturity, we also used the long-term and short-term debts as dependent variables. Therefore, we split the total debt ratio into two sub-variables: i) the long-term debt ratio

(LTD/TA) and ii) the short-term debt ratio (STD/TA), which were calculated as the ratio between long-term and short-term debts and total assets, respectively.
Regarding the independent variables used in the analysis, we defined a standard set of firm-specific variables that are consistent with the trade-off theory and the pecking order perspective and are widely used in the literature on the capital structure of SMEs.
Firm age. This variable is defined as the natural log of the age of firm *i* in year *t*.
Firm size. The size is measured as the natural logarithm of sales of firm *i* in year *t*.
Asset structure. This variable is calculated as the ratio between fixed assets and total assets of firm *i* in year *t* (Daskalakis et al., 2017; Daskalakis & Psillaki, 2008; López-Gracia & Sogorb-Mira, 2008).
Profitability. We measured profitability as the ratio between earnings before interest, tax depreciation and amortization (EBITDA) and total assets. We believe that this measure is more appropriate than ROI or ROE because it is less susceptible to accounting manipulations due to the evaluation of amortization and/or depreciation (Denis & Kruse, 2000).
Firm risk. We measured the risk as the absolute value of the difference between the annual profitability of a given firm *i* in year *t* and the average annual profitability of firm *i* across the sampled period (Antoniou et al., 2008).
Growth opportunities. This variable is proxied by the annual growth rate of the sales of firm *i* in year *t*.
Liquidity. Liquidity is measured as current assets on current liabilities of firm *i* in year *t*.
Non-debt tax shields. This variable is calculated as the ratio of the total depreciation expenses over the total assets of firm *i* in year *t* (Titman & Wessels, 1988).

3.3 Summary statistics

In this section, we show the sample composition and the descriptive statistics of our main variables. Table 1 presents the firm distribution by industry. Specifically, we highlight that most Italian SMEs operate in four key industries, namely, manufacturing, wholesale and retail trade, construction and health, education and other services.

Table 1
Firm distribution by economic sectors

Industry	**No of firms**	**Proportion (%)**
Agriculture, forestry and mining	235	1.62%
Manufacturing	5325	36.73%
Construction	1370	9.45%
Wholesale and retail trade	4019	27.72%
Media, communications and software	500	3.45%
Business services	561	3.87%
Transport	640	4.41%
Health, education and others	1850	12.76%
Total	14500	100.00%

Table 2 shows the descriptive statistics of the dependent and independent variables. We highlight that Italian SMEs use debts (D/TA) to finance over 60% of their investments. Specifically, they use short-term debt (STD/TA) to finance approximately 50% of the firm's assets, while just under 10% is financed with long-term debts (LTD/TA). On average, Italian SMEs are moderately young, averaging 22 years of age. The firm size measured in terms of sales is approximately equal to 5 million euros, with an annual growth rate of approximately 4%. The profitability is approximately 12%. Finally, Italian SMEs have a good level of liquid assets. The average current assets to current

liabilities ratio is equal to 1.68. Consequently, this value denotes a typical feature of SMEs, i.e., the high incidence of current rather than fixed assets, which represents a condition of flexibility for these firms to change assets if the business needs change. Therefore, this finding also explains the incidence of short-term debt that is near 50%.

Table 2
Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
D/TA	139474	.596	.274	0	.999
LTD/TA	139474	.097	.158	0	.999
STD/TA	139474	.499	.271	0	.999
Firm age	159500	22	14	0	126
Firm size (€/000)	159402	4,962	6,602.53	0	49,899.32
Asset tangibility	159392	.213	.231	0	.947
Profitability	139474	.121	.109	0	.479
Volatility	139474	.047	.051	0	.452
Growth opportunity	144816	.046	.229	-.503	.798
Liquidity	157112	1.68	1.153	.13	7.41
Non-debt tax shields	156961	.044	.073	0	.544

D/TA is the total debt ratio. LTD/TA is the long-term debt ratio. STD/TA is the short-term debt ratio. Firm age denotes the age of a firm. Firm size denotes firm sales (€/000). Asset tangibility is the ratio of fixed assets to total assets. Profitability is the ratio of EBITDA to total assets. Growth opportunity is the annual revenue growth rate. Profit volatility is the absolute value of the difference between the annual profitability of a given firm *i* and the average annual profitability of firm *i* across the sampled period. Liquidity is the ratio between current assets on current liabilities. The non-debt tax shields is the ratio of depreciation to total assets.

Table 3 contains the correlation coefficients between the dependent and independent variables. While the coefficients are highly significant, they are quite low, indicating that multicollinearity problems in our models are modest. In particular, we note that consistent with the pecking order theory, financial leverage (expressed in terms of D/TA, LTD/TA and STD/TA) is negatively associated with firm age, profitability and liquidity and positively associated with growth opportunities. Thus, while increases in firm age, profitability and liquidity lead to low leverage, an increase in growth opportunities leads to high financial leverage.

Table 3

Correlation matrix – Pearson coefficients

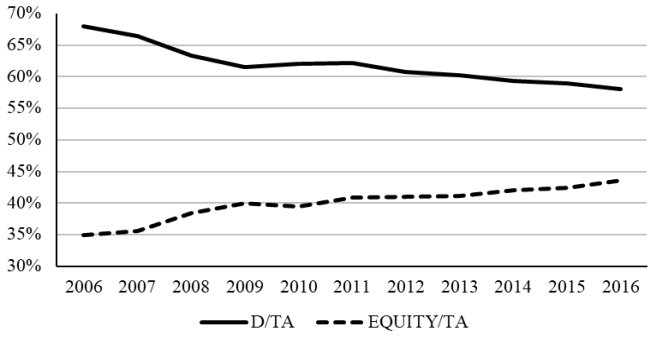
	1	2	3	4	5	6	7	8	9	10	11
1. D/TA	1										
2. LTD/TA	.307***	1									
3. STD/TA	.833***	-.271***	1								
4. Firm age	-.200***	-.012***	-.195***	1							
5. Firm size	.028***	-.070***	.069***	.203***	1						
6. Asset tangibility	-.157***	.375***	-.376***	.169***	-.064***	1					
7. Profitability	-.225***	-.123***	-.156***	-.120***	-.023***	-.063***	1				
8. Growth opportunity	.065***	.001	.065***	-.106***	.016***	-.025***	.146***	1			
9. Volatility	-.146***	-.111***	-.083***	-.122***	-.088***	-.109***	.340***	.020***	1		
1. Liquidity	-.561***	-.062***	-.528***	.118***	-.033***	-.170***	.103***	.069***	-.065***	1	
11. Non-debt tax shields	-.165***	.274***	-.324***	.027***	-.139***	.520***	.001	-.019***	-.025***	-.031***	1

D/TA is the total debt ratio. LTD/TA is the long-term debt ratio. STD/TA is the short-term debt ratio. Firm age denotes the age of a firm. Firm size denotes firm sales (€/000). Asset tangibility is the ratio of fixed assets to total assets. Profitability is the ratio of EBITDA to total assets. Growth opportunity is the annual revenue growth rate. Profit volatility is the absolute value of the difference between the annual profitability of a given firm *i* and the average annual profitability of firm *i* across the sampled period. Liquidity is the ratio between current assets on current liabilities. The non-debt tax shields is the ratio of depreciation to total assets. *** denote significance at the .1% level.

Finally, in Figure 1, we plot the annual average of total debt ratio and equity ratio. During the period 2006-2016, Italian SMEs moderately decreased leverage (approximately 10%) and increased equity capital. This evidence seems to be consistent with the most common narrative of the crisis, according to which firms replace debt with equity due to credit rationing problems.

Figure 1

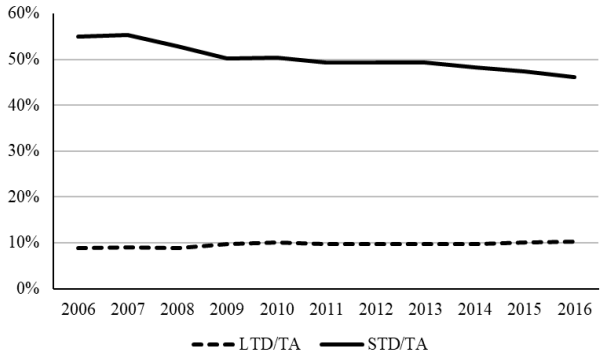
Annual average of D/TA ratio and Equity/TA ratio



In Figure 2, we graph the debt maturity structure of Italian SMEs and, specifically, the annual average values of the long-term (LTD/TA) and short-term debt (STD/TA) ratios. As noted above, SMEs primarily finance their assets with short-term debt. Moreover, while during the period under investigation, Italian SMEs reduced their short-term debt, they did not evidently modify long-term debt.

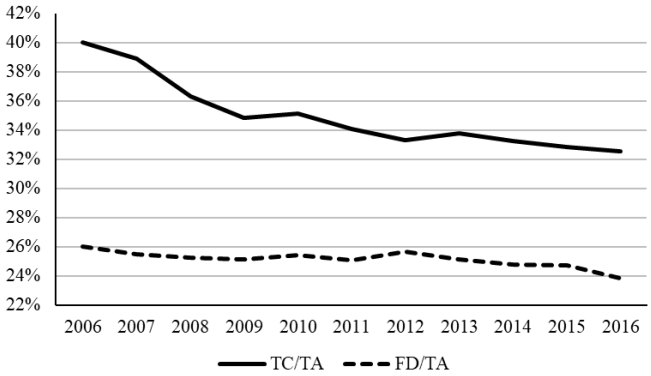
Figure 2

Annual average of LTD/TA ratio and STD/TA ratio



Finally, in Figure 3, we plot the two main components of the total debt ratio, namely, the trade credit (TC/TA) and the financial debt (FD/TA) scaled on total assets. Figure 3 shows that the average values of both trade credit and financial debt decreased during the period under investigation. However, trade credit reduced more markedly than financial debt. This result suggests that during the crisis, credit rationing is a phenomenon that involves not only banks but also the firms that become much more selective in giving credit to other firms. Clearly, when banks reduce lending to firms, this impacts the possibility that firms can lend to other operators. This evidence is in line with the literature suggesting that bank credit and trade credit probably act as complements but not as substitutes (Love et al., 2007).

Figure 3
Annual average of TC/TA ratio and FD/TA ratio



3.3 Methodology

To explore the impact of the global financial crisis on the determinants of the capital structure of SMEs, we estimated the following panel model:

$$Leverage_{i,t} = \alpha + \beta X_{i,t} + \gamma C_t + \lambda PC_t + \theta_i + \varepsilon_{i,t} \qquad [1]$$

where $Leverage_{i,t}$ is the dependent variable that we measured, alternatively, in terms of the ratio between total debt and total assets (D/TA), long-term debt on total assets (LTD/TA) and short-term debts on total assets (STD/TA) of firm i in year t. On the right-hand side of the equation, X denotes a matrix of explanatory variables of firm i in year t and β is a vector of variable coefficients. To control for time-invariant heterogeneity at the firm level, we also included the firm fixed effects (θ_i). Finally, C is a dummy variable for the crisis period, equal to 1 for each year of the crisis and 0 otherwise. PC is the dummy variable for the post-crisis period, equal to 1 for the years after the crisis and 0 otherwise. Specifically, we divided our time period of 2006-2016 into three sub-periods: a pre-crisis period from 2006 to 2008, a crisis period from 2009 to 2012 and a post-crisis period from 2013 to 2016. We highlight that the effect of the global financial crisis on the Italian economy and banking system is evident beginning in 2009, when the Italian GDP decreased by approximately 6%. Moreover, given that the sovereign debt crisis strongly affected Italy between 2011 and 2012, we considered the period 2009-2012 as the crisis period. Alternatively, we estimated the model [1] by including the year-fixed effects instead of the two dummy variables C and PC. Finally, $\varepsilon_{i,t}$ is the error term.
We estimated the model [1] using a fixed-effects model with robust standard errors clustered at the firm level. This choice was confirmed by the Hausman test, which excluded the random-effects panel model.
Finally, to assess the change in capital structure determinants during the different sub-periods noted above, we estimated the model [1] for each of the three sub-periods separately.
To mitigate the impact of outliers, all variables with extreme values are winsorized at the 1% and 99% levels.

4. Results

4.1 The determinants of SMEs' capital structure and debt maturity

In Table 4, we present the results of the of model [1] that we estimated with three alternative dependent variables, namely, the Total debt ratio (columns 1 and 2), the Short-term debt ratio

(columns 3 and 4) and the Long-term debt ratio (columns 5 and 6). The models were estimated using clustered robust standard errors to serial correlation and heteroskedasticity. Multicollinearity was not a specific problem in our models. Finally, we highlight that all the models are highly significant at the 0.1 percent level.

Table 4

Regression results

Dependent variable	Total debt ratio		Short-term debt ratio		Long-term debt ratio	
	1	2	3	4	5	6
Firm age	-.033***	-.018***	-.032***	-.020***	.0005	.004
	(-12.71)	(-5.92)	(-12.85)	(-6.94)	(.23)	(1.31)
Firm size	.033***	.033***	.03***	.03***	.006***	.006***
	(24.55)	(24.61)	(21.59)	(21.60)	(4.99)	(5.08)
Asset tangibility	-.127***	-.120***	-.309***	-.304***	.216***	.219***
	(-19.20)	(-18.01)	(-5.64)	(-49.54)	(3.21)	(3.54)
Profitability	-.265***	-.271***	-.192***	-.195***	-.097***	-.101***
	(-43.64)	(-44.50)	(-32.51)	(-32.93)	(-22.72)	(-23.51)
Growth opportunity	.022***	.024***	.019***	.021***	.005***	.004***
	(17.22)	(18.31)	(14.02)	(15.53)	(4.13)	(3.34)
Profit volatility	-.102***	-.111***	-.089***	-.094***	-.016*	-.021***
	(-11.93)	(-12.91)	(-1.49)	(-11.00)	(-2.56)	(-3.40)
Liquidity	-.210***	-.208***	-.280***	-.279***	.072***	.073***
	(-65.35)	(-64.58)	(-91.13)	(-9.39)	(26.51)	(26.53)
Non-debt tax shields	.106***	.104***	-.005	-.007	.123***	.123***
	(7.36)	(7.25)	(-.39)	(-.50)	(9.24)	(9.24)
2008		-.025***		-.016***		-.013***
		(-3.91)		(-19.27)		(-15.65)
2009		-.03***		-.022***		-.01***
		(-29.00)		(-22.00)		(-9.70)
2010		-.033***		-.028***		-.007***
		(-28.08)		(-23.84)		(-5.78)
2011		-.041***		-.033***		-.01***
		(-29.11)		(-24.33)		(-7.69)
2012		-.042***		-.031***		-.014***
		(-28.13)		(-21.73)		(-1.17)
2013		-.042***		-.03***		-.016***
		(-26.23)		(-19.43)		(-1.48)
2014		-.043***		-.032***		-.014***
		(-24.61)		(-19.61)		(-8.16)
2015		-.044***		-.035***		-.012***
		(-23.49)		(-19.61)		(-6.55)
2016		-.045***		-.037***		-.010***
		(-22.37)		(-19.45)		(-5.38)
Crisis period	-.020***		-.018***		-.003***	
	(-23.82)		(-21.50)		(-3.58)	
Post-crisis period	-.024***		-.02***		-.005***	
	(-18.35)		(-16.11)		(-4.08)	
Constant	.292***	.262***	.369***	.343***	-.100***	-.105***

	(14.51)	(12.72)	(18.45)	(16.85)	(-5.60)	(-5.77)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes
N	135823	135823	135823	135823	135823	135823
F	1088.4***	719.9***	1589.3***	1006.5***	18.5***	126.9***
R^2	.291	.297	.374	.377	.0804	.0832
F test - FE vs. Pooled	24.76***	25.02***	21.86***	21.96***	15.81***	15.85***
Hausman test – FE vs. RE	2634.83***	2149.86***	776.31***	893.32***	2767.59***	2784.86***

This table reports the regression results of the model [1] with the total debt ratio, short-term debt ratio and long-term debt ratio as dependent, respectively. Firm age denotes the natural logarithm of firm age. Firm size denotes the natural logarithm of total sales. Asset tangibility is the ratio between fixed assets and total assets. Profitability is the ratio of EBITDA to total assets. Growth opportunity is the annual revenue growth rate. Profit volatility is the absolute value of the difference between the annual profitability of a given firm *i* and the average annual profitability of firm *i* across the sampled period. Liquidity is the ratio of current assets to current liabilities. Non-debt tax shields is the ratio of depreciation to total assets. Crisis period is a dummy variable equal to 1 for each year of the 2009-2012 period and 0 otherwise. Post-crisis period is a dummy variable equal to 1 for each year of the 2013-2016 period and 0 otherwise. Year dummies control for year fixed effects. *t* values are reported in parentheses. Robust standard errors are clustered at the firm level. * and *** denote significance at the 5% and .1% levels, respectively.

Columns 1 and 2 present the estimates of the model with the total debt ratio as dependent. The coefficients show signs mainly consistent with the pecking order hypothesis. In particular, firm age, asset tangibility, profitability, growth opportunities, profit volatility and liquidity are significant at the 0.1 percent level and present signs consistent with the pecking order theory. Consistent with the extant empirical literature, the sign of firm age is significantly negative since older firms may use a lower leverage than younger firms because they can rely on accumulated funds (López-Gracia & Sogorb-Mira, 2008; Michaelas et al., 1999; Palacín-Sánchez et al., 2013). Tangibility is negatively related to leverage, suggesting that firms with a large proportion of tangible assets use, on average, less debt than those that do not have such assets (Aybar-Arias, Casino-Martínez, & López-Gracia, 2012; Daskalakis & Psillaki, 2008). Profitability is found to be negative, as profitable firms prefer to use internal funds rather than external resources (Daskalakis & Psillaki, 2008; Sogorb-Mira, 2005). Moreover, SMEs with high growth rates use more debt given that internal resources may not be sufficient to finance growth processes so that growth pushes the firm into borrowing (Michaelas et al., 1999; Palacín-Sánchez et al., 2013). Conversely, profit volatility negatively impacts financial leverage (Bradley, Jarrell, & Kim, 1984; MacKie-Mason, 1990; Wald, 1999). This result could be explained considering the high bankruptcy/financial distress costs in Italy (World Bank, 2016). When bankruptcy costs are high, larger profit volatility may discourage firms from borrowing because this behavior increases the probability of failure (Delcoure, 2007). Finally, liquidity is negatively related to leverage, suggesting that firms with more liquid assets are less likely to borrow funds (Deesomsak, Paudyal, & Pescetto, 2004).

In accordance with trade-off predictions, the coefficient of firm size is positive and is in line with the empirical literature. Finally, we estimate a positive relation between non-debt tax shields and financial leverage, contrasting with the trade-off hypothesis. Regarding this point, the empirical literature is inconclusive. Given that a non-debt tax shields may represent a measure of the firm's asset securability, scholars suggest that more securable assets lead to an increase in firm debt (Bradley et al., 1984; Wald, 1999).

Therefore, we can conclude that the capital structure choices in SMEs are more affected by the consideration of the information asymmetry problems, as the SMEs' characteristics increase agency problems with creditors (Pettit & Singer, 1985).

Finally, we show that the coefficients of the dummy variables Crisis (β = -.020, p < .1%) and Post-crisis (β = -.024, p < .1%) are significantly negative (column 1). This finding suggests that during the crisis, SMEs reduced their leverage compared to the pre-crisis period due to severe external

financing constraints. We obtained the same results when replacing the two dummy variables with the year-fixed effects.

The model with the short-term debt ratio as the dependent variable (columns 3 and 4 in Table 4) presents results in line with the theoretical predictions. As expected, the short-term debt ratio is negatively related to firm age, asset tangibility, profitability, profit volatility and liquidity and is positively related to growth opportunities (Hall et al., 2004; Palacín-Sánchez et al., 2013; Sogorb-Mira, 2005). Moreover, we find that firm size positively impacts the short-term debt ratio. While this latter result does not support the theoretical expectation, it is in line with the empirical literature (Sogorb-Mira, 2005). Finally, the variable non-debt tax shields presents a negative and insignificant coefficient (columns 3 and 4). This result could be explained considering that short-term debts in SMEs are mainly represented by trade credits that are not related to tax considerations.

The model with the long-term debt ratio as the dependent variable (columns 5 and 6 in Table 4) presents coefficients mainly consistent with the theoretical expectations. Specifically, the long-term debt ratio is positively affected by firm size, asset tangibility and liquidity and is negatively affected by profit volatility and profitability (Hall et al., 2004; Palacín-Sánchez et al., 2013; Sogorb-Mira, 2005). In particular, the relation between the long-term debt ratio and firm liquidity could be explained considering that the high bankruptcy costs in Italy could induce firms to remain liquid if they decide to issue long-term debt since healthier balance sheet conditions could increase the possibility to borrow long term (Antoniou et al., 2003; Schiantarelli & Srivastava, 1997). Despite the expectations, we find that the coefficient of firm age is closer to zero and is no longer significant (Hall et al., 2004). Furthermore, we observe that while the sign of the coefficients of growth opportunities is not in line with theoretical expectation, its magnitude is close to zero. Therefore, growth opportunities are related more to short-term than to long-term debt (Hall et al., 2004; Palacín-Sánchez et al., 2013). Finally, the long-term debt ratio is positively related to non-debt tax shields. This result strongly supports the idea that non-debt tax shields are a measure of assets securability. Furthermore, we highlight that the long-term debt ratio is positively and markedly affected mainly by asset tangibility and non-debt tax shields. In summary, tangible and more securable assets favor long-term borrowing because they mitigate insolvency risk.

Finally, the coefficients of the dummy variables Crisis and Post-crisis are significantly negative both in the model with the short-term debt ratio (column 3) and long-term debt as the dependent variables (column 4). However, compared to the latter model, the sizes of the effects for the Crisis and Post-crisis dummies are higher in the former model. This difference indicates that the credit shock has negatively affected firms' financial conditions primarily via the short-term debt channels. Conversely, the financial crisis had a limited impact on long-term financing channels. Therefore, short-term debt channels are more sensitive to the conditions of credit supply.

4.2 Capital structure and debt maturity determinants in different macroeconomic states

In Table 5, we compare the results of the model [1] estimated for the three sub-sample periods. Table 5 presents the results for our three dependent variables, namely, the Total debt ratio (columns 1-3), the Short-term debt ratio (columns 4-6) and the Long-term debt ratio (columns 7-9). The models were estimated using clustered robust standard errors for serial correlation and heteroskedasticity. Multicollinearity was not a specific problem in our models. Finally, we highlight that all the models are highly significant at the 0.1 percent level.

Table 5

Regression results for the pre-crisis, crisis and post-crisis periods

Dependent variables	Total debt ratio			Short-term debt ratio			Long-term debt ratio		
	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	.029**	-.072***	-.067***	.005	-.061***	-.082***	.035***	-.014***	.026***
	(3.12)	(-18.96)	(-13.66)	(.57)	(-14.92)	(-15.91)	(4.59)	(-3.58)	(4.74)
Firm size	.034***	.032***	.032***	.034***	.034***	.032***	.0006	-.0008	.002
	(8.52)	(15.36)	(13.05)	(8.92)	(14.47)	(12.41)	(.21)	(-.37)	(.97)
Asset tangibility	-.364***	-.086***	-.091***	-.436***	-.312***	-.285***	.066***	.272***	.233***
	(-25.32)	(-7.53)	(-7.64)	(-33.81)	(-27.55)	(-26.83)	(4.60)	(21.94)	(18.72)
Profitability	-.250***	-.317***	-.265***	-.197***	-.242***	-.177***	-.07***	-.099***	-.119***
	(-16.58)	(-32.46)	(-3.43)	(-13.03)	(-25.14)	(-2.99)	(-6.57)	(-16.22)	(-17.14)
Growth opportunity	-.023***	.025***	.022***	-.016***	.018***	.016***	-.010***	.01***	.007**
	(-21.78)	(16.51)	(11.10)	(-14.52)	(1.50)	(7.47)	(-1.41)	(6.33)	(3.19)
Profit volatility	-.015	-.160***	-.085***	-.025	-.138***	-.053***	.01	-.026**	-.040***
	(-.81)	(-11.31)	(-7.20)	(-1.35)	(-9.70)	(-4.68)	(.68)	(-3.10)	(-4.05)
Liquidity	-.175***	-.161***	-.161***	-.285***	-.254***	-.249***	.121***	.100***	.096***
	(-19.10)	(-34.81)	(-36.88)	(-31.25)	(-53.36)	(-52.94)	(14.57)	(22.58)	(21.25)
Non-debt tax shields	.205***	.115***	.077***	.168***	.003	.022	.057†	.125***	.064***
	(4.29)	(5.77)	(3.93)	(3.92)	(.14)	(1.16)	(1.67)	(6.67)	(4.02)
Constant	.302***	.365***	.35***	.331***	.355***	.433***	-.043	.008	-.141***
	(5.43)	(11.88)	(9.54)	(6.22)	(1.30)	(11.32)	(-1.00)	(.26)	(-3.90)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	26753	55498	53572	26753	55498	53572	26753	55498	53572
F	404.7***	431.8***	442.2***	511.9***	639.9***	594.6***	35.87***	127.0***	109.4***
R^2	.350	.251	.257	.431	.315	.338	.061	.109	.087

This table reports the regression results of the model [1] with the total debt ratio, short-term debt ratio and long-term debt ratio as the dependent for the pre-crisis, crisis and post-crisis periods separately. Firm age denotes the natural logarithm of the age of a firm. Firm size denotes the natural logarithm of total sales. Asset tangibility is the ratio between fixed assets and total assets. Profitability is the ratio of EBITDA to total assets. Growth opportunity is the annual revenue growth rate. Profit volatility is the absolute value of the difference between the annual profitability of a given firm *i* and the average annual profitability of firm *i* across the sampled period. Liquidity is the ratio of current assets to current liabilities. Non-debt tax shields is the ratio of depreciation to total assets. *t* values are reported in parentheses. Robust standard errors are clustered at the firm level. †, ** and *** denote significance at the 10%, 1 and .1% levels, respectively.

Table 6 presents the differences between the estimated coefficients (presented in Table 5) across our sub-periods. In particular, for each dependent variable, we report the differences between the regression coefficients across i) the crisis and pre-crisis periods (ΔT1) and ii) the post-crisis and pre-crisis periods (ΔT2) and their significance levels (Clogg, Petkova, & Haritou, 1995). For brevity, we omit the differences across the post-crisis and crisis periods. However, these differences can be calculated as the difference between ΔT2 and ΔT1.

Table 6

Differences between coefficients across the pre-crisis, crisis and post-crisis periods

	Total debt ratio		Short-term debt ratio		Long-term debt ratio	
	ΔT1	ΔT2	ΔT1	ΔT2	ΔT1	ΔT2
	1	2	3	4	5	6
Firm age	-.102***	-.097***	-.066***	-.087***	-.049***	-.009
	(-1.00)	(-9.08)	-(6.49)	(-8.21)	(-5.70)	(-.99)
Firm size	-.001	-.002	.000	-.002	-.001	.002
	(-.31)	(-.34)	(-.04)	(-.47)	(-.38)	(.45)
Asset tangibility	.278*	.273***	.124***	.151***	.206***	.167***
	(2.59)	(14.62)	(7.23)	(9.05)	(1.92)	(8.85)
Profitability	-.067***	-.015	-.045*	.020	-.030*	-.049**
	(-3.73)	(-.86)	(-2.51)	(1.15)	(-2.43)	(-3.89)
Growth opportunity	.049***	.045***	.033***	.031***	.020***	.017***
	(25.98)	(2.29)	(16.70)	(12.79)	(11.03)	(7.41)
Profit volatility	-.145***	-.070**	-.113***	-.028	-.036*	-.050**
	(-6.27)	(-3.20)	(-4.81)	(-1.30)	(-2.16)	(-2.86)
Liquidity	.014	.014	.031**	.036***	-.021*	-.025*
	(1.36)	(1.38)	(3.01)	(3.50)	(-2.23)	(-2.60)
Non-debt tax shields	-.090†	-.128*	-.165**	-.146**	.068†	.007
	(-1.74)	(-2.49)	(-3.45)	(-3.12)	(1.73)	(.17)

This table reports the differences between the coefficients presented in Table 5 across the crisis and pre-crisis periods (ΔT1) and across the post-crisis and pre-crisis periods (ΔT2). Firm age denotes the natural logarithm of the age of a firm. Firm size denotes the natural logarithm of total sales. Asset tangibility is the ratio between fixed assets and total assets. Profitability is the ratio of EBITDA to total assets. Growth opportunity is the annual revenue growth rate. Profit volatility is the absolute value of the difference between the annual profitability of a given firm *i* and the average annual profitability of firm *i* across the sampled period. Liquidity is the ratio of current assets to current liabilities. Non-debt tax shields is the ratio of depreciation to total assets. *t* values are reported in parentheses. Robust standard errors are clustered at the firm level. †, *, **, *** denote significance at the 10%, 5%, 1% and .1% levels, respectively.

4.2.1 Total debt ratio

Table 5 shows that in the pre-crisis period, the signs of the determinants of the total debt ratio could be explained by a more balanced mix of the trade-off theory and pecking order theory (column 1). Therefore, before the economic crisis, SMEs decide their capital structure by balancing the costs and the benefits of the debt and the information problems related to external resources. Specifically, in the pre-crisis period, firm age (β = .029, p < 1%), firm size (β = .034, p < .1%) and growth opportunities (β = -.023, p < .1%) are highly significant in their impact on the total debt ratio and

are more in line with trade-off theory. In contrast, tangibility ratio (β = -.364, p < .1%), profitability (β = -.250, p < .1%) and liquidity (β = -.175, p < .1%) are more in line with pecking order theory. As expected, the sign of profit volatility (β = -.015, p < .1%) is negative but not significant. As in the previous results (Table 4), in the pre-crisis period, a non-debt tax shields (β = .205, p < .1%) presents a significant and positive association with leverage, so that the trade-off hypothesis was not supported. Moreover, we highlight that in the pre-crisis period, the firm's capital structure is mainly driven by asset tangibility and profitability.

Regarding the crisis period, the capital structure determinants emerge as more coherent with the pecking order predictions than those of the pre-crisis sub-sample. Our results show that in the crisis period, firm age, profit volatility, asset tangibility, profitability and growth opportunities significantly change the magnitude of their impact on firm leverage compared to the previous period (column 2 of Table 5). In particular, the coefficient of firm age changes its sign from positive (β = .029 p < .1%) to negative (β = -.072, p < .1%). Profit volatility sharply increased in its negative impact on corporate leverage from -.0151 to -.160 (p < .1%). Asset tangibility reduced its impact from -.364 (p < .1%) to -.086 (p < .1%). Profitability increased its negative effect on firm leverage from -.250 (p < .1%) to -.317 (p < .1%). Finally, growth opportunities changed its impact from negative (β = -.023, p < .1%) to positive (β = .025, p < .1%). As shown in column 1 of Table 6, these differences in regression coefficients are highly significant. Firm size, liquidity and non-debt tax shields did not significantly change their impacts. These results suggest that in a crisis scenario, SMEs have to address the credit rationing policies by external investors, causing them to become apparently more prudent in their financial decisions. Therefore, during the crisis, i) risky firms are more financially constrained due to their high bankruptcy probability, causing them to reduce their leverage more than in the previous period; ii) profitable firms decrease their leverage because they prefer to use internal resources more than during the pre-crisis period; iii) firms with high tangible assets reduce their leverage less than during the previous period because they probably use these assets as collateral to access external financial resources more than during the previous period; iv) high-growth firms are constrained to borrowing funds to finance new business opportunities since during the crisis, internal funds decreased (Zeitun et al., 2017).

In the post-crisis period, capital structure determinants partially revert back to the pre-crisis levels (column 3 of Table 5), which is evident for profitability and profit volatility. Compared to the crisis period, during the post-crisis period, the coefficient of profitability reduced its negative impact from -.317 (p < .1%) to -.265 (p < .1%). Profit volatility changed its impact from -.160 (p < .1%) to -.085 (p < .1%). As shown in column 2 of Table 6, the difference between the post-crisis and pre-crisis levels for profitability is not significant (diff. = -.015, p > 10%). Therefore, during the post-crisis period, profitability impacts the total debt ratio in the same way as before the crisis. Conversely, while profit volatility presents a significant difference (diff. = -.07, p < 1%) between the two periods, it strongly reverts back to the pre-crisis level. Finally, liquidity did not significantly change its impact during the three macroeconomic states.

4.2.2 Short-term debt ratio

In columns 4-6, the determinants of short-term debt ratio before, during and after the financial crisis are shown. The signs of the coefficients are consistent with the theoretical expectations. In particular, during the pre-crisis period (column 4), the short-term debt ratio is negatively affected by asset tangibility (β = -.436, p < .1%), profitability (β = -.197, p < .1%) and liquidity (β = -.285, p < .1%). However, the coefficients of firm age and profit volatility are not significant in their impact, and the growth opportunities (β = -.016, p < .1%) negatively affect the short-term debt ratio (Akbar et al., 2013). Moreover, as noted above, firm size (β = .034, p < .1%) positively impacts the short-term debt ratio. In summary, during the pre-crisis period, the short-term debt ratio is mainly driven by asset tangibility, liquidity and profitability. Except for firm size, during the crisis period, the determinants of the short-term debt ratio significantly changed their impact compared to the pre-

crisis period (see column 5 of Table 5 and column 3 of Table 6). Firm age increased its negative impact from zero to -.061 ($p < .1\%$), asset tangibility reduced its negative impact form -.436 ($p < .1\%$) to -.312 ($p < .1\%$), profitability increased its negative effect from -.197 ($p < .1\%$) to -.242 ($p < .1\%$), growth opportunities changed its impact from negative ($\beta = -.016$, $p < .1\%$) to positive ($\beta = .018$, $p < .1\%$), profit volatility sharply increased its negative impact from -.025 ($p > 10\%$) to -.138 ($p < .1\%$), liquidity reduced its negative impact from -.285 ($p < .1\%$) to -.254 ($p < .1\%$), and non-debt tax shields became non-significant in its effect. Therefore, compared to the pre-crisis period, in a crisis scenario, risky firms reduce the short-term debt ratio due to their vulnerability. Moreover, these firms are more severely affected by the credit crunch given their higher difficulties in bearing the increased costs of short-term debt and in rolling over their debt at a time when it is impossible and/or extremely costly to do so.

After the crisis, short-term debt determinants partially revert back to the pre-crisis levels (column 6 of Table 5). This trend is markedly evident for profit volatility, whose impact changed from -.138 to -.053, and for profitability, which reverted back to the pre-crisis level. In column 4 of Table 6, it appears that the differences between the post-crisis and pre-crisis periods for profit volatility and profitability are not significant. The other variables did not substantially change their impacts during the post-crisis period with respect to the crisis period.

4.2.3 Long-term debt ratio

Finally, considering the model with the long-term debt ratio as the dependent variable (columns 7-9 of Table 5), the signs of the coefficients are in line with the predictions. In the pre-crisis period (column 7), the long-term debt ratio is mainly affected by liquidity ($\beta = .121$, $p < .1\%$), asset tangibility ($\beta = .066$, $p < .1\%$) and profitability ($\beta = -.07$, $p < .1\%$). However, we find that firm size and profit volatility are not significant and have low magnitudes, while firm age ($\beta = .035$, $p < .1\%$) has a positive impact on the long-term debt ratio. As known, lenders are not willing to provide long-term credit where there is no credible possibility of repayment. Therefore, companies with high reputations (proxied by age) and that can provide assets as collateral are more likely to take out long-term loans.

Compared to the pre-crisis period, the determinants of the long-term debt ratio were modified in their impact during the crisis (column 8 of Table 5). However, during the crisis, only the asset tangibility strongly modified its impact compared to the pre-crisis scenario. Specifically, firm age changed its effect from positive ($\beta = .035$, $p < .1\%$) to negative ($\beta = -.014$, $p < .1\%$), asset tangibility increased its effect from .066 ($p < 1\%$) to .272 ($p < 1\%$), profitability reduced its impact from -.07 ($p < 1\%$) to -.099 ($p < 1\%$), growth opportunities changed its impact from negative ($\beta = -.01$, $p < .1\%$) to positive ($\beta = .01$, $p < .1\%$), profit volatility became significant and negative ($\beta = -.026$, $p < 1\%$), but near zero and liquidity did not change its effect markedly. In column 5 of Table 6, the differences in coefficients across the pre-crisis and crisis periods are shown. Asset tangibility presents the highest difference across the two periods. Therefore, during the crisis, the availability of tangible assets to use as collateral represents a key driver of the ability to borrow to long-term debt because it reduces the insolvency risk and, hence, increases the possibility that long-term loans will be repaid.

Finally, in the post-crisis period, certain determinants of the long-term debt ratio partially revert back to the pre-crisis levels (column 9 of Table 5). In particular, in line with the pre-crisis level, i) firm age changed from negative to positive, and ii) the positive impacts of asset tangibility and growth opportunities slightly decreased. The other coefficients remained nearly the same as the crisis levels. In column 6 of Table 6, except for firm age, firm size and non-debt tax shields, the differences in coefficients across the post-crisis and pre-crisis periods appear to be significantly different from zero.

5 Conclusions

Based on a comprehensive sample of Italian SMEs during the 2006-2016 period, we use the recent financial crisis to test its effects on SMEs' financial decisions. This study contributes to the literature on capital structure and debt maturity determinants of SMEs in several ways. Although capital structure is a subject largely explored in the literature, to the authors' knowledge, few empirical studies have focused on the effects of credit shocks on the determinants of SMEs' capital structure. Therefore, we provide new empirical evidence on the impact of economic crises on firms' capital structure and debt maturity. Moreover, this paper is the first comprehensive study on Italian SMEs during the recent financial crisis.

First, in line with the previous literature, our results show that the SMEs' capital structure is based on short-term debt and specifically on trade credit. Second, we show that the trade-off theory is less able to explain the SMEs' capital structure decisions than is the pecking order theory. Therefore, this finding supports the idea that SMEs are more involved in managing asymmetry information problems due to the use of external resources than by balancing the benefits and costs of debt. In particular, corporate financial leverage is mainly driven by profitability, liquidity, asset tangibility and profit volatility. Regarding debt maturity, we note that while asset tangibility, liquidity and profitability significantly affect the short-term debt ratio, asset tangibility is the main factor that affects the long-term debt ratio.

Third, we contribute to the literature on the impacts of credit shocks on capital structure decisions of SMEs. Specifically, our results provide evidence that credit supply shocks negatively impacted the leverage of Italian SMEs. We find that during and after the crisis, Italian SMEs significantly decreased their leverage, particularly their short-term debt exposure, with respect to the pre-crisis period. As a result, we find that the short-term debt channel is more sensitive to credit conditions than is the long-term debt channel. Interestingly, we show that credit shock also negatively impacted trade credit. Thus, trade credit does not compensate for the reduction in bank credit but instead acts as a complement to bank credit. Consequently, this result challenges the common expectation that during a crisis, trade credit substitutes for bank credit.

Finally, our findings reveal that during different macroeconomic states, the determinants of both capital structure and debt maturity significantly changed their effects. Specifically, during the crisis, profit volatility, asset tangibility and profitability demonstrated the greatest change in their impacts compared to the pre-crisis period, such that riskier and more profitable firms reduced their leverage more than during the pre-crisis period. At the same time, firms with high tangible assets reduced their debt ratio less than during the previous period. While we obtained the same results for short-term debt, we highlight that among the determinants of the long-term debt ratio, asset tangibility showed higher variation in its impact across the crisis and pre-crisis periods. On the one hand, these results suggest that during the crisis, asset tangibility is a key driver of the ability to raise external resources since fixed assets act as collateral that reduce credit risk. On the other hand, given that short-term debt increases firm vulnerability, riskier firms reduce the short-term debt, and profitable firms prefer to use internal resources so that they decrease their short-term debt during the crisis compared to the pre-crisis period. Finally, we highlight that during the post-crisis period, capital structure and debt maturity determinants partially reverted to pre-crisis levels.

We believe our findings have practical implications for policy makers in designing their policies during an economic crisis. Specifically, given that firms adjust their financing decisions during different macroeconomic conditions, financial institutions should consider the patterns of firm leverage when they project credit policies for SMEs.

Finally, we are aware that our methodology has several limitations. First, we captured the relation between the traditional underlying capital structure mechanisms using a set of firm-level variables as proxies that are noisy and act as an abbreviated version of the actual underlying mechanisms. Furthermore, we recognize the endogeneity issues of our study, which limit our conclusions.

However, we believe that the prior empirical research, theoretical arguments, and anecdotal evidence provide sufficient material to support our conclusions.

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