# Short- and long-term debt determinants in Swedish SMEs

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## Abstract

**Purpose** – This paper aims to empirically investigate the capital structure determinants of small and medium-sized enterprises (SMEs) with a particular focus on short- and long-term debt.

**Design/methodology/approach** – Several methods were used to analyse a sample of 15,897 Swedish SMEs for which complete financial information was available for a four-year period following the 2008 financial crisis, i.e. the 2009-2012 period.

**Findings** – The results indicate that eight explanatory variables – i.e. size, age, growth, profitability, liquidity, asset tangibility, non-debt tax shields and industry affiliation – are associated to various extents with SME debt policy.

**Research limitations/implications** – The current study is limited to examining a sample of Swedish SMEs in five industry sectors covering the 2009-2012 period. Further research could examine the generalizability of the present results by considering other countries, industry sectors and periods.

**Practical implications** – As debt policy influences firm performance, value and survival, SME owners and managers, regulators and financial institutions may benefit from studies considering a relatively large number of capital structure determinants, several of which are linked to short- and long-term debt in various ways.

**Originality/value** – This study is one of the few to examine the determinants of short- and long-term debt in SMEs, which play a fundamental role in the economy, using a large-scale cross-sectional database covering a period following the 2008 financial crisis.

**Keywords** Capital structure, SMEs, Debt policy

**Paper type** Research paper

## 1. Introduction

Previous researchers have highlighted the role of small and medium-sized enterprises (SMEs) in job creation and dynamic economic development in recent decades, noting that access to capital is a vital requirement for SME investment, survival and growth (Audretsch and Elston, 2002; Fagiolo and Luzzi, 2006; Hutchinson and Xavier, 2006; Oliveira and Fortunato, 2006). At the same time, SMEs experience various challenges in obtaining external financing (Berger and Udell, 1998; Carpenter and Petersen, 2002), and SMEs and large companies usually differ in their capital structures (Ang, 1992; Uzzi and Gillespie, 1999).

A body of research has paid close attention to the financing challenges facing SMEs. These challenges have been studied from both the supply- and demand-side perspectives. The supply-side perspective suggests that lender–borrower information asymmetry is the main explanation of SMEs' financing obstacles (Berger and Udell, 1998; Myers, 1984; Myers and Majluf, 1984). The demand-side perspective suggests that SMEs use mainly internal financing and less external financing because SME owners prefer to maintain autonomy and control of their firms and to avoid agency costs (Berger and Udell, 1998; Chittenden *et al.*, 1996; Jordan *et al.*, 1998). The latter notion is the foundation of pecking order theory, which will be applied here.

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In addition to the fact that SMEs prefer internal financing to external financing, pecking order theory suggests that short-term debt (STD) is preferred to long-term debt (LTD). It is also suggested that STD and LTD in some cases can be substitutes for each other (Petersen and Rajan, 1997). In a recent study, Yazdanfar and Öhman (2016) investigated the existence of dynamic capital structure in Swedish SMEs across their life-cycle stages. Their findings suggest that the STD level is relatively high in early life-cycle stages, decreasing later on, while the LTD level is low in all life-cycle stages investigated, although increasing slightly as firms age. Based on these results, the authors suggested further studies of the firm-level determinants of capital structure, including STD and LTD.

This paper examines unlisted SMEs and empirically tests hypotheses explaining the determinants of STD and LTD. A relatively large number of determinants is included to investigate whether these determinants affect STD and LTD in similar or different ways.

Researchers have begun to pay attention to SMEs, and studies of the issue examined here are considered relevant (López Gracia and Sogorb Mira, 2008), not least since the 2008 financial crisis (Proença *et al.*, 2014). Moreover, as argued by Mackie-Mason (1990), Hall *et al.* (2004), Daskalakis and Psillaki (2008), Cassia and Vismara (2009) and Mac an Bhaird and Lucey (2014), financing behaviour is context dependent and country-level differences in financial, taxation, legal and regulatory systems can influence the capital structure of SMEs.

Because the Swedish legal and regulatory systems, taxation level and financial environment differ somewhat from those of other European countries, it might be illuminating to study SME debt policy in the Swedish context. The Swedish economy has been described as relatively small and export oriented. Earlier, large manufacturing companies influenced Swedish economy to a great extent and accounted for a significant part of the gross domestic product, employment and growth. However, the importance of smaller companies has increased dramatically in recent decades. At present, approximately 99 per cent of all Swedish firms are SMEs, and this sector generates jobs for the great majority of the Swedish labour force (Yazdanfar and Öhman, 2015). The financial system in Sweden is bank oriented compared with the market-oriented financial systems in other countries, such as the USA and the UK (Sjögren and Zackrisson, 2005). However, the lack of flexibility in the Swedish financial system has created a situation in which SMEs suffer from lender–borrower information asymmetry and have to use methods to finance their operations that differ from those of large companies (Yazdanfar, 2011). Moreover, the country's social welfare system, which equally benefits all Swedish residents, is built on high taxes (Swedish Central Bank, 2013), and Sweden is one of the few EU Member States that has kept its national currency and is accordingly not part of the euro area.

The remainder of the paper proceeds as follows. Section 2 presents the theoretical framework, reviews previous research, discusses the selection of determinants and formulates the hypotheses. Section 3 focuses on the sampling and certain methodological issues, and Section 4 presents the empirical results. The paper ends with a discussion of the findings and presents the concluding remarks.

## 2. Theoretical framework, previous research and hypotheses

### *2.1 Theoretical framework*

The efficient market approach has been criticized due to its underlying assumption of market perfection (Chaganti *et al.*, 1995). Actually, financial markets are imperfect in ways related to information asymmetry, agency conflict costs and moral hazard (Myers and Majluf, 1984). Two leading approaches, the static trade-off approach and pecking order theory, are usually cited in capital structure research. According to the trade-off approach, a firm's optimal capital structure is related to the trade-offs among the effects of the tax benefits of borrowing,

bankruptcy costs and agency costs (Frank and Goyal, 2003; Myers, 1984). Therefore, the capital structure can be described as optimal when the costs and advantages of debt are equal (Fama and French, 2002). The optimal capital structure may differ from firm to firm depending on their characteristics, including size, age and tax and asset structure.

Unlike the trade-off approach, pecking order theory suggests that there is no well-defined target for a firm's debt ratio (López Gracia and Aybar Arias, 2000; Myers and Majluf, 1984). Instead, owners and managers usually rely on retained earnings, i.e. available liquid assets, as their main source of financing for operations and investments (Myers and Majluf, 1984) because of their desire to retain independence and autonomy (Hutchinson, 1995; Sogorb Mira, 2005). If the retained earnings are insufficient, they tend to use STD rather than LTD, and LTD rather than external equity capital (Berger and Udell, 1998; Chittenden *et al.*, 1996; Jordan *et al.*, 1998). According to pecking order theory, information asymmetry is related to verification costs, adverse selection and moral hazard (Berger and Udell, 1998). SME owners and managers experiencing problems related to information asymmetry are more likely than others to use internal financing (Chittenden *et al.*, 1996; Rajan and Zingales, 1995). These circumstances also affect the choice between internal and external financing as well as between STD and LTD, thereby affecting the capital structure of SMEs (Hutchinson, 1995; Myers, 2001; Myers and Majluf, 1984; Sogorb Mira, 2005).

### *2.2 Previous empirical research*

Several empirical studies have used pecking order theory to empirically address the determinants of firm capital structure, though these studies have considered different outcome variables and determinants. Because financing behaviour is suggested to be context dependent (Mac an Bhaird and Lucey, 2014), the following literature review first presents studies originating from different countries and then presents studies comparing different countries.

Van der Wijst and Thurik (1993) tested the relationship between a number of determinants and capital structure in a sample of retail trade firms in the former West Germany over a period of 24 years (1954-1977). The empirical results of ordinary least squares (OLS) and least squares dummy variable (LSDV) analyses indicated that tangible assets, inventory turnover and return on investment significantly affected the firms' capital structure. The authors also suggested that pecking order theory was relevant to explaining the external financing pattern of the sampled firms.

Chittenden *et al.* (1996) investigated a cross-sectional panel data sample covering 3,480 SMEs in the UK over five years using OLS regression. The results indicated a significant relationship between the financial structure of small firms and their profitability, asset structure, size, age and stock market flotation. In addition, profitable firms financed their operations with retained earnings, whereas less profitable firms financed their investments mainly with debt. Small and young firms with no track record of profitability were more likely to rely on SDT than on LTD. Some years later, Michaelas *et al.* (1999) used several regression models to analyse the capital structure determinants of 3,500 SMEs in the UK over the 10 years from 1986 to 1995. The results indicated that size, age, profitability, growth and future growth opportunities, operating risk, asset structure, stock turnover and net debt were significantly related to the level of STD and LTD. In addition, the authors observed that the capital structure of SMEs was time and industry dependent. Focusing on a relatively small sample, Mac an Bhaird and Lucey (2010) applied multivariate regression and generalization of the seemingly unrelated regressions model to analyse the firm characteristic determinants of the capital structure of 299 Irish SMEs. The results suggested that the use of LTD was

positively and significantly related to firm size and collateral, and negatively related to firm age.

Heshmati (2002) investigated 2,261 Swedish micro firms for the 1994-1997 period, applying pecking order theory. The findings indicated that small businesses avoid financing their operations through bank loans because these are seen as a way of losing control of the firm. Yazdanfar and Ödlund (2010) studied the relationship between firm-level determinants and capital structure among 10,905 Swedish micro firms for the 2006-2007 period. The results of multiple regression models indicated that size, age, asset tangibility and profitability were significantly and negatively related to SDT, whereas size and asset tangibility were positively related to profitability and negatively related to LTD. The impact of age and asset tangibility on STD debt shifted depending on industry affiliation.

Sánchez Vidal and Martin Ugedo (2005) investigated several hypotheses among a sample of 1,566 Spanish firms over the 1994-2000 period. The results supported pecking order theory for SMEs and high-growth and highly leveraged firms. López Gracia and Sogorb Mira (2008) used the generalized method of moments (GMM) and the two-stage least squares (2SLS) methods to analyse a sample of 3,569 Spanish SMEs over a 10-year period from 1995 to 2004. The influence of ten explanatory variables on the capital structure was investigated. The study provided evidence that age, size, growth, profitability and non-debt tax shields were significantly related to the leverage ratio. The findings also indicated that the financing pattern of small SMEs differed from that of larger SMEs. Consistent with pecking order theory, the sampled firms tended to rely more on internal financing than on debt financing.

Serrasqueiro and Caetano (2015) applied the LSDV dynamic estimator to investigate a sample of 53 Portuguese SMEs for the 1998-2005 period, obtaining a total of 371 observations. The results indicated that the most profitable and the oldest SMEs relied less than did other firms on debt capital. Moreover, larger SMEs used more debt capital than did smaller SMEs. Proença *et al.* (2014) studied the determinants of SME capital structure and the effects of the 2008 financial crisis on SME capital structure in a sample of 12,857 Portuguese SMEs for the 2007-2010 period. The results suggested that liquidity, asset structure and profitability are the most important determinants of SME capital structure. The results also indicated a downward tendency in SME debt ratios during the financial crisis.

To investigate potential country-level differences, Hall *et al.* (2004) used regression models to examine the impact of several determinants of capital structure in a large sample of 4,000 unlisted SMEs, 500 from each of eight European countries, for 1995. The results indicated that profitability, growth, collateral, size and age affected STD and LTD. Collateral had the strongest and growth the weakest effect on the firms' capital structure. In addition, variation of capital structure among the sampled firms was likely explained by country- and firm-specific differences. Daskalakis and Psillaki (2008) used panel data methods to examine the capital structure determinants of 1,252 Greek firms and 2,006 French firms for the 1998-2002 period. The results indicated that profitability, asset structure and risk were negatively related to leverage, whereas firm size was positively related to leverage. However, growth was positively related to leverage only in French firms. Mac an Bhaird and Lucey (2014) used over 90,000 firm-level observations from 13 countries over the 2002-2008 period to examine an extensive set of firm-level characteristics, industry effects and country-level institutional variables. The results suggested a negative relationship between age, size, collateral and growth, respectively, and STD. While size, collateral and growth influenced LTD positively, age and profitability negatively influenced LTD. The results also indicated that SMEs tend to avoid LTD to maintain their autonomy and independence. Institutional variables in terms of cross-country differences in financial, legal and regulatory systems, and industry affiliation influenced the firms' capital structure.

| Variables | Definition | References |
|---|---|---|
| Short-term debt (SDT) | Debt repayable within one year divided by total assets | Hall *et al.* (2000), Michaelas *et al.* (1999), Myers (1984), Van der Wijst and Thurik (1993) |
| Long-term debt (LTD) | Debt repayable beyond one year divided by total assets | Hall *et al.* (2000), Michaelas *et al.* (1999), Myers (1984), Van der Wijst and Thurik (1993) |
| Size | Natural logarithm of sales | López Gracia and Sogorb Mira (2008), Ozkan (2001), Rajan and Zingales (1995), Titman and Wessels (1988) |
| Age | Natural logarithm of the number of years since firm inception as of the year of data collection | Chittenden *et al.* (1996), Esperança *et al.* (2003), Hall *et al.* (2004), Mac an Bhaird and Lucey (2010, 2014), Yazdanfar and Ödlund (2010) |
| Growth | Percentage change in sales | Hall *et al.* (2004), Titman and Wessels (1988) |
| Profitability | Earnings after interest and tax divided by total assets | Abor (2008), Chittenden *et al.* (1996), Daskalakis and Psillaki (2008), Hall *et al.* (2000), Heshmati (2002), Michaelas *et al.* (1999), Sogorb Mira (2005) |
| Liquidity | Ratio of current assets to total assets | Deesomsak *et al.* (2004), De Jong *et al.* (2011), Ozkan (2001) |
| Tangibility | Fixed assets divided by total assets | Chittenden *et al.* (1996), Fama and French (2002), Frank and Goyal (2003), Michaelas *et al.* (1999), Ozkan (2001), Van der Wijst and Thurik (1993) |
| Non-debt tax shields | Depreciation divided by total assets | Frank and Goyal (2003), Heshmati (2002), López Gracia and Sogorb Mira (2008) |
| Industry affiliation | Dummy variable (1-5) | Chittenden *et al.* (1996), Esperança *et al.* (2003), Frank and Goyal (2003), Jordan *et al.* (1998), Mac an Bhaird and Lucey (2010), Michaelas *et al.* (1999), Myers (1984), Van der Wijst and Thurik (1993) |

**Table I.**
Definitions of and references for the variables

The literature review demonstrates that the question of what determines capital structure is the subject of ongoing investigation in different countries, justifying further research. The studies presented above are based on different samples, different periods and use different methods. Given that financing behaviour is context dependent, the current study contributes to the literature by focusing on a large number of SMEs operating in the Swedish context in a four-year period following the 2008 financial crisis.

### *2.3 Selection of variables and hypotheses*

Van der Wijst and Thurik (1993) have emphasized the difficulty of selecting capital structure determinants in SMEs, as they are often related to factors that cannot be measured adequately. In addition, Harris and Raviv (1991) have argued that factors such as motives and circumstances could affect firm capital structure but appear to be virtually unquantifiable. However, according to the literature review, there seems to be a near consensus about the set of capital structure determinants presented below.

*2.3.1 The dependent variables.* The current study captures capital structure using the two dependent variables STD and LTD. These were chosen because recent studies suggest that STD and LTD can be supplementary as well as complementary (Ghosh, 2015). In the same vein, Chittenden *et al.* (1996) and Van der Wijst and Thurik (1993) argue that total debt determinants may mask important differences between STD and LTD.

*2.3.2 The independent variables and hypotheses.* Based on previous studies and due to data availability, eight independent variables are considered in the current study, i.e. size, age, growth, profitability, liquidity, asset tangibility, non-debt tax shields and industry affiliation, the last being a control variable. The variables are described and their references are presented in Table I.

Based on pecking order theory, a firm's *size* is associated with its debt capacity (Fama and French, 2002), though there is controversy about the nature of this association. On one hand, large firms experience fewer problems related to information asymmetry, moral hazard, financial distress and bankruptcy risk. This leads to lower monitoring and residual costs for external financing (Fama and French, 2002; Myers, 1984; Rajan and Zingales, 1995) and may motivate larger firms to rely more on LTD. On the other hand, most smaller firms tend to use STD as a substitute for LTD to minimize the impact of problems related to information asymmetry (Hall *et al.*, 2000; Michaelas *et al.*, 1999). Therefore, the financing pattern differs between smaller and larger SMEs (López Gracia and Sogorb Mira, 2008). The effect of size on STD is expected to be negative (Hall *et al.*, 2004; Yazdanfar and Ödlund, 2010), whereas the effect of size on LTD is expected to be positive (Chittenden *et al.*, 1996; Esperança *et al.*, 2003; Mac an Bhaird and Lucey, 2010; Psillaki and Daskalakis, 2009). Accordingly, the following hypotheses are formulated:

*H1a*. There is a negative relationship between the size of SMEs and their STD.

*H1b*. There is a positive relationship between the size of SMEs and their LTD.

Firms' debt capital structure may not remain constant over their life cycle, but be dependent on the firm's *age* (Berger and Udell, 1998; Hall *et al.*, 2004; Mac an Bhaird and Lucey, 2011; Yazdanfar and Ödlund, 2010). According to pecking order theory, the older the firm, the longer it has had to accumulate retained profits and the greater its ability to eschew debt financing (Mac an Bhaird and Lucey, 2010, 2014; Myers, 1984). Moreover, it is suggested that younger firms tend to use proportionally more STD than do older ones (Sánchez Vidal and Martin Ugedo, 2005, 2012; Yazdanfar and Öhman, 2016) and that younger firms tend to have less LTD than do older ones (Serrasqueiro and Nunes, 2012; Yazdanfar and Öhman, 2016). Accordingly, young SMEs seem to be more dependent on STD, whereas old SMEs seem to be more able to access LTD. Accordingly, the following hypotheses are formulated:

*H2a*. There is a negative relationship between the age of SMEs and their STD.

*H2b*. There is a positive relationship between the age of SMEs and their LTD.

Pecking order theory predicts a positive relationship between firm *growth* and debt ratio because high-growth firms usually need large amounts of capital to finance their growth (Hall *et al.*, 2004; López Gracia and Sogorb Mira, 2008; Mac an Bhaird and Lucey, 2014; Sánchez Vidal and Martin Ugedo, 2005). Accordingly, the following hypotheses are formulated:

*H3a*. There is a positive relationship between the growth of SMEs and their STD.

*H3b*. There is a positive relationship between the growth of SMEs and their LTD.

Applying pecking order theory, previous studies have suggested that retained profits is the main financial resource for SMEs, which prefer to use retained earnings over external financing and issuing new equity (Chittenden *et al.*, 1996; Daskalakis and Psillaki, 2008; Hall *et al.*, 2004; Mac an Bhaird and Lucey, 2010, 2014; Myers, 2001; Serrasqueiro and Caetano, 2015; Sogorb Mira, 2005). Profitable firms would therefore tend to reduce their agency costs of debt by reducing their debt ratios (Daskalakis and Psillaki, 2008; Goddard *et al.*, 2005; López Gracia and Sogorb Mira, 2008; Majumdar and Chhibber, 1999; Proença *et al.*, 2014; Van

der Wijst and Thurik, 1993; Yazdanfar and Öhman, 2015). Based on the agency cost perspective, the relationships between firm *profitability* and STD and LTD, respectively, are likely to be negative. The following hypotheses are accordingly formulated:

*H4a*. There is a negative relationship between the profitability of SMEs and their SDT.

*H4b*. There is a negative relationship between the profitability of SMEs and their LTD.

The *liquidity* ratio is an indication of a firm's ability to invest as well as to pay for current liabilities and expenditures. From the pecking order theory perspective, highly liquid firms are expected to have less debt (Deesomsak *et al.*, 2004; Proença *et al.*, 2014) because the increased availability of financial resources in terms of liquidity generated by retained profits enables such firms to be less dependent on debt capital (De Jong *et al.*, 2011). Accordingly, the following hypotheses are formulated:

*H5a*. There is a negative relationship between the liquidity of SMEs and their SDT.

*H5b*. There is a negative relationship between the liquidity of SMEs and their LTD.

As *asset tangibility* is related to information asymmetry, moral hazard and agency costs, a firm's tangibility ratio is expected to affect its capital structure in terms of LTD (Daskalakis and Psillaki, 2008; Esperança *et al.*, 2003; Hall *et al.*, 2004; Mac an Bhaird and Lucey, 2010, 2014; Van der Wijst and Thurik, 1993). Accordingly, firms with a high tangibility ratio, i.e. having a large number of collateral-based assets, are more likely to borrow money from banks and other financial institutions (Rajan and Zingales, 1995; Titman and Wessels, 1988). However, STD is not connected to the firms' number of collateral-based assets in this way. Instead, and in line with pecking order theory, these firms prefer STD to LTD (Hall *et al.*, 2004; Jordan *et al.*, 1998; Yazdanfar and Ödlund, 2010). The related hypotheses are as follows:

*H6a*. There is a negative relationship between the asset tangibility of SMEs and their STD.

*H6b*. There is a positive relationship between the asset tangibility of SMEs and their LTD.

*Non-debt tax shields* are regarded as alternatives to the tax benefits of debt financing using either STD or LTD. A negative association between leverage and depreciation as a proxy for non-debt tax shields is therefore expected (Frank and Goyal, 2003; Heshmati, 2002; López Gracia and Sogorb Mira, 2008; Michaelas *et al.*, 1999; Sogorb Mira, 2005). The related hypotheses are as follows:

*H7a*. There is a negative relationship between the non-debt tax shields of SMEs and their STD.

*H7b*. There is a negative relationship between the non-debt tax shields of SMEs and their LTD.

The capital structure in a certain *industry* is influenced by several variables, such as type of technology and the need for capital and labour, affecting firms' demand for financial resources (Chittenden *et al.*, 1996; Jordan *et al.*, 1998; Mac an Bhaird and Lucey, 2010, 2014; Michaelas *et al.*, 1999; Van der Wijst and Thurik, 1993). In addition, firms in the same industry that face the same environmental conditions will have the same variance in capital structure. As the association between capital structure determinants and industry affiliation may overlap, an industry dummy variable is used to capture the impact of the industry-specific effect on STD and LTD across various industries. The following hypotheses are therefore formulated:

*H8a*. There is a relationship between the industry of SMEs and their STD.

*H8b*. There is a relationship between the industry of SMEs and their LTD.

## 3. Data sample and model specifications

### *3.1 Data sample*

SMEs are defined as firms with fewer than 200 employees (Statistics Sweden, 2014). The panel data used in the current study are drawn from the commercial database, Affärsdata, which registers accounting and financial information for all Swedish companies. The target population comprises all active, unlisted, non-financial limited liability firms with fewer than 200 employees. More than 95,000 firms in five industries were included in the initial sample over the 2009-2012 period. To avoid sampling biases and to focus only on active firms, the data were filtered. Firms with less than four years' data, missing data and/or outliers were excluded. As a result, the final sample included firms with at least one employee, total capital above approximately EUR 10,350 (SEK 100,000), and total revenue above approximately EUR 20,700 (SEK 200,000). Consequently, the final sample contained 15,897 limited liability SMEs.

### *3.2 Model specification*

Following previous studies (Chittenden *et al.*, 1996; Mac an Bhaird and Lucey, 2010, 2014; Michaelas *et al.*, 1999), both OLS and fixed-effects models were used as the main statistical techniques in the current study. To test the hypotheses, and to identify potential relationships between the independent and dependent variables, the OLS estimation regression model was specified as follows:

$$STD_{i,t} = \alpha_t + \beta_1 \text{Size}_{i,t} + \beta_2 \text{Age}_{i,t} + \beta_3 \text{Growth}_{i,t} + \beta_4 \text{Profitability}_{i,t} + \beta_5 \text{Liquidity}_{i,t} + \beta_6 \text{Tangibility}_{i,t} + \beta_7 \text{Taxshields}_{i,t} + \beta_8 \text{Industry} + \mu_{it}$$

$$LTD_{i,t} = \alpha_t + \beta_1 \text{Size}_{i,t} + \beta_2 \text{Age}_{i,t} + \beta_3 \text{Growth}_{i,t} + \beta_4 \text{Profitability}_{i,t} + \beta_5 \text{Liquidity}_{i,t} + \beta_6 \text{Tangibility}_{i,t} + \beta_7 \text{Taxshields}_{i,t} + \beta_8 \text{Industry} + \mu_{it}$$

where:

- $STD_{i,t}$ = short-term debt, i.e. debt repayable within one year divided by total assets, book values;
- $LTD_{i,t}$ = long-term debt, i.e. debt repayable beyond one year divided by total assets, book values;
- $Size_{i,t}$ = the size of firm $i$ at time $t$, the natural logarithm of net sales;
- $Age_{i,t}$ = firm age, the natural logarithm of the number of years since the firm was established as of the year of data collection;
- $Growth_{i,t}$ = the percentage change in sales;
- $Profitability_{i,t}$ = the profitability of firm $i$ at time $t$, earnings after interest and tax divided by total assets;
- $Liquidity_{i,t}$ = the ratio of current assets to total assets;
- $Tangibility_{i,t}$ = asset tangibility divided by total assets;
- $Taxshields_{i,t}$ = non-debt tax shields, depreciation divided by total assets;
- $Industry$ = industry affiliation, dummy variable (1-5); and
- $\mu_{it}$ = error term.

When analysing longitudinal data, the fixed-effects model makes it possible to control for the stability of the relationships between the independent and dependent variables related to

individual firms during the period under study. Moreover, the Hausman specification test was used to determine whether the fixed-effects or the random-effects model was most appropriate for the data, and the results indicate that the fixed-effects model is the most appropriate. Accordingly, to test the robustness of the OLS results, the fixed-effects regression was implemented according to the following equations:

$$STD_{i,t} = \alpha_t + \beta_1 \text{Size}_{i,t} + \beta_2 \text{Age}_{i,t} + \beta_3 \text{Growth}_{i,t} + \beta_4 \text{Profitability}_{i,t} + \beta_5 \text{Liquidity}_{i,t} + \beta_6 \text{Tangibility}_{i,t} + \beta_7 \text{Taxshields}_{i,t} + \eta_{it}$$

$$LTD_{i,t} = \alpha_t + \beta_1 \text{Size}_{i,t} + \beta_2 \text{Age}_{i,t} + \beta_3 \text{Growth}_{i,t} + \beta_4 \text{Profitability}_{i,t} + \beta_5 \text{Liquidity}_{i,t} + \beta_6 \text{Tangibility}_{i,t} + \beta_7 \text{Taxshields}_{i,t} + \eta_{it}$$

All parameters in the fixed-effects models are similar to those of the OLS model; $\eta_i$ accounts for the effect for each firm in the model.

## 4. Results

### *4.1 Results of the descriptive analysis*

The descriptive statistics indicate the means and standard deviations of the variables included in the study. Table II reports the industry classifications according to the single-digit Standard Industrial Classification codes; the sample consists of firms in the retail trade (42.5 per cent of the sample), wholesale (18.2 per cent), metal manufacturing (17.6 per cent), health care (11.3 per cent) and construction (10.4 per cent) industries. Overall, on average, the sampled firms have approximately ten employees and are approximately 22 years old. Accordingly, the firms are generally mature and have reached a significant scale of operation. The average STD and LTD ratios are approximately 25 and 9 per cent, respectively. This means that the total debt is approximately 34 per cent and that equity accounts for most of the SMEs' capital. This also means that the STD ratio is much higher than the LTD ratio, and that STD markedly affects the capital structure of the sampled SMEs. The means and standard deviations of the STD and LTD ratios for the various industries indicate variation across the sampled firms.

Table II further shows that the average profitability ratio is 12.1 per cent and the average annual growth is 6.8 per cent. The levels of liquidity, asset tangibility and non-debt tax shields are 25.5, 23.5 and 3.4 per cent, respectively. The results indicate some variation between the industries.

### *4.2 Results of the correlation analysis*

The correlations between the variables are checked to determine the relationship between the variables and to examine the risk of multi-collinearity among the independent variables. Table III shows the Pearson's correlations between all the variables included in the multivariate models. Almost all the correlations reported below are statistically significant at the 1 per cent level, and the results further indicate that the correlation coefficients of the independent variables are small, which means that the risk of multi-collinearity is fairly low.

The significant and negative correlation between profitability and STD and LTD, respectively, indicates that profitable SMEs tend to use more internal and less external financing. Moreover, the STD ratio is significantly positively correlated with growth, liquidity and non-debt tax shields, but is significantly negatively correlated with size, age and asset tangibility. The LTD ratio is significantly positively correlated with size, age, asset tangibility and non-debt tax shields, but is significantly negatively correlated with liquidity.

| Industry | Employees | Age | STD | LTD | Size | Age, log | Growth | Profitability | Liquidity | Tangibility | Tax shield |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Retail* | | | | | | | | | | | |
| Mean | 7.980 | 22.038 | 0.230 | 0.074 | 8.983 | 2.857 | 0.048 | 0.107 | 0.249 | 0.190 | 0.029 |
| Std. Dev. | 13.696 | 15.243 | 0.127 | 0.121 | 1.261 | 0.719 | 0.951 | 0.126 | 0.209 | 0.208 | 0.041 |
| No. of obs. | 27,016 | 27,016 | 27,016 | 27,016 | 27,016 | 27,016 | 27,016 | 27,016 | 27,016 | 27,016 | 27,016 |
| No. of firms | 6,754 | 6,754 | 6,754 | 6,754 | 6,754 | 6,754 | 6,754 | 6,754 | 6,754 | 6,754 | 6,754 |
| % firms | 42.5 | 42.5 | 42.5 | 42.5 | 42.5 | 42.5 | 42.5 | 42.5 | 42.5 | 42.5 | 42.5 |
| *Wholesale* | | | | | | | | | | | |
| Mean | 16.302 | 25.373 | 0.193 | 0.171 | 9.801 | 3.011 | 0.095 | 0.098 | 0.152 | 0.256 | 0.028 |
| Std. Dev. | 26.227 | 17.468 | 0.118 | 0.141 | 1.598 | 0.694 | 1.274 | 0.170 | 0.182 | 0.237 | 0.038 |
| No. of obs. | 11,560 | 11,560 | 11,560 | 11,560 | 11,560 | 11,560 | 11,560 | 11,560 | 11,560 | 11,560 | 11,560 |
| No. of firms | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 |
| % firms | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 |
| *Metal* | | | | | | | | | | | |
| Mean | 13.600 | 23.836 | 0.321 | 0.095 | 9.090 | 1.287 | 0.052 | 0.106 | 0.220 | 0.295 | 0.050 |
| Std. Dev. | 20.952 | 14.989 | 0.150 | 0.130 | 1.315 | 0.298 | 0.585 | 0.155 | 0.208 | 0.223 | 0.043 |
| No. of obs. | 11,232 | 11,232 | 11,232 | 11,232 | 11,232 | 11,232 | 11,232 | 11,232 | 11,232 | 11,232 | 11,232 |
| No. of firms | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 |
| % firms | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 | 17.6 |
| *Health care* | | | | | | | | | | | |
| Mean | 3.240 | 15.309 | 0.211 | 0.036 | 7.858 | 2.505 | 0.098 | 0.250 | 0.415 | 0.283 | 0.038 |
| Std. Dev. | 6.129 | 9.484 | 0.112 | 0.078 | 0.814 | 0.723 | 0.773 | 0.196 | 0.255 | 0.261 | 0.059 |
| No. of obs. | 7,180 | 7,180 | 7,180 | 7,180 | 7,180 | 7,180 | 7,180 | 7,180 | 7,180 | 7,180 | 7,180 |
| No. of firms | 1,795 | 1,795 | 1,795 | 1,795 | 1,795 | 1,795 | 1,795 | 1,795 | 1,795 | 1,795 | 1,795 |
| % firms | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |

(*continued*)

**Table II.**
Results of the descriptive statistics (2009-2012)

Table II.

| Industry | Employees | Age | STD | LTD | Size | Age, log | Growth | Profitability | Liquidity | Tangibility | Tax shield |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Construction* | | | | | | | | | | | |
| Mean | 6.996 | 19.279 | 0.375 | 0.080 | 8.516 | 2.725 | 0.099 | 0.108 | 0.316 | 0.231 | 0.033 |
| Std. Dev. | 13.622 | 12.570 | 0.170 | 0.123 | 1.288 | 0.735 | 1.063 | 0.175 | 0.230 | 0.242 | 0.041 |
| No. of obs. | 6,600 | 6,600 | 6,600 | 6,600 | 6,600 | 6,600 | 6,600 | 6,600 | 6,600 | 6,600 | 6,600 |
| No. of firms | 1,650 | 1,650 | 1,650 | 1,650 | 1,650 | 1,650 | 1,650 | 1,650 | 1,650 | 1,650 | 1,650 |
| % firms | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 |
| *Total* | | | | | | | | | | | |
| Mean | 9.848 | 21.916 | 0.252 | 0.092 | 8.975 | 2.554 | 0.068 | 0.121 | 0.252 | 0.235 | 0.034 |
| Std. Dev. | 17.974 | 15.129 | 0.146 | 0.129 | 1.408 | 0.895 | 0.962 | 0.161 | 0.225 | 0.230 | 0.044 |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| No. of firms | 15,897 | 15,897 | 15,897 | 15,897 | 15,897 | 15,897 | 15,897 | 15,897 | 15,897 | 15,897 | 15,897 |
| *ANOVA* | | | | | | | | | | | |
| *F* | 900.30 | 611.50 | 3069.48 | 1732.70 | 2715.858 | 611.50 | 9.516 | 1410.8 | 1916.89 | 571.66 | 555.85 |
| *Sig.* | | | | | | | | | | | |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |

**Notes:** $STD_{i,t}$ = short-term debt, i.e. debt repayable within one year divided by total assets, book values; $LTD_{i,t}$ = long-term debt, i.e. debt repayable beyond one year divided by total assets, book values; $Size_{i,t}$ = the size of firm *i at time t*, the natural logarithm of net sales; $Age_{i,t}$ = firm age, the natural logarithm of the number of years since the firm was established as of the year of data collection; $Growth_{i,t}$ = the percentage change in sales; $Profitability_{i,t}$ = the profitability of firm *i at time t*, earnings after interest and tax divided by total assets; $Liquidity_{i,t}$ = the ratio of current assets to total assets; $Tangibility_{i,t}$ = asset tangibility divided by total assets; $Taxshields_{i,t}$ = non-debt tax shields, depreciation divided by total assets

**Table III.**
Results of the correlation analysis (2009-2012)

| Variables | STD | LTD | Size | Age | Growth | Profitability | Liquidity | Tangibility | Tax shield |
|---|---|---|---|---|---|---|---|---|---|
| STD | 1 | −0.260** | −0.005** | −0.256** | 0.020** | −0.009* | 0.017** | −0.166** | 0.095** |
| *P* | | (0.000) | (0.000) | (0.000) | (0.000) | (0.028) | (0.000) | (0.000) | (0.000) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| LTD | −0.260** | 1 | 0.059** | 0.049** | 0.001 | −0.162** | −0.336** | 0.327** | 0.061** |
| *P* | (0.000) | | (0.000) | (0.000) | (0.918) | (0.000) | (0.000) | (0.000) | (0.000) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| Size | −0.005** | 0.059** | 1 | 0.145** | 0.008 | 0.021** | −0.262** | 0.063** | −0.003 |
| *P* | (0.000) | (0.000) | | (0.000) | (0.052) | (0.000) | (0.000) | (0.000) | (0.512) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| Age | −0.256** | 0.049** | 0.145** | 1 | −0.027** | −0.114** | −0.091** | −0.052** | −0.182** |
| *P* | (0.000) | (0.000) | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| Growth | 0.020** | 0.001 | 0.008 | −0.027** | 1 | 0.102** | 0.014** | 0.008 | −0.012** |
| *P* | (0.000) | (0.918) | (0.052) | (0.000) | | (0.000) | (0.000) | (0.057) | (0.000) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| Profitability | −0.009* | −0.162** | 0.021** | −0.114** | 0.102** | 1 | 0.286** | −0.071** | −0.071** |
| *P* | (0.028) | (0.000) | (0.000) | (0.000) | (0.000) | | (0.000) | (0.000) | (0.000) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| Liquidity | 0.017** | −0.336** | −0.262** | −0.091** | 0.014** | 0.286** | 1 | −0.314** | −0.062** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | (0.000) | (0.000) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| Tangibility | −0.166** | 0.327** | 0.063** | −0.052** | 0.008 | −0.071** | −0.314** | 1 | 0.332** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) | (0.057) | (0.000) | (0.000) | | (0.000) |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |
| Tax shield | 0.095** | 0.061** | −0.003 | −0.182** | −0.012** | −0.071** | −0.062** | 0.332** | 1 |
| *P* | (0.000) | (0.000) | (0.512) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 | 63,588 |

**Notes:** $*p < 0.05$; $**p < 0.01$; $STD_{i,t}$ = short-term debt, i.e. debt repayable within one year divided by total assets, book values; $LTD_{i,t}$ = long-term debt, i.e. debt repayable beyond one year divided by total assets, book values; $Size_{i,t}$ = the size of firm *i at time t*, the natural logarithm of net sales; $Age_{i,t}$ = firm age, the natural logarithm of the number of years since the firm was established as of the year of data collection; $Growth_{i,t}$ = the percentage change in sales; $Profitability_{i,t}$ = the profitability of firm *i at time t*, earnings after interest and tax divided by total assets; $Liquidity_{i,t}$ = the ratio of current assets to total assets; $Tangibility_{i,t}$ = asset tangibility divided by total assets; $Taxshields_{i,t}$ = non-debt tax shields, depreciation divided by total assets

The significant and negative correlation between STD and LTD implies that they are substitutes for each other.

*4.3 Results of the regression analyses*

The results of the OLS and fixed-effects models presented in Table IV are statistically significant for the two dependent variables at the 1 per cent level. The results suggest a positive relationship between size and STD and a negative relationship between size and LTD, implying that the larger the SME, the more STD and the less LTD it will use. A possible reason for these findings, which are in contrast to *H1a* and *H1b*, is that the sampled SMEs, even the larger ones, generally rely more on STD than LTD. In line with *H2a* and *H2b*, the OLS model suggests a significant and negative relationship between age and STD and a significant and positive relationship between age and LTD. However, the fixed-effects model suggests a significant and negative relationship between age and the two debt variables, which is in line with *H2a* but in contrast to *H2b*. The results of the fixed-effects model suggest that older SMEs use less debt, as they can rely more on internally generated capital.

The results of the two models suggest a positive and significant association between growth rate and the dependent variables. In accordance with *H3a* and *H3b*, SMEs with a relatively high growth rate tend to use more external financing. The results further indicate that profitability is negatively and significantly related to the debt variables, more profitable SMEs being less likely to use external financing. These findings, generated through the OLS and fixed-effects models, are consistent with *H4a* and *H4b*. Similar results can be observed concerning the relationship between liquidity and the debt variables. In line with *H5a* and *H5b*, high-liquidity SMEs are less likely than low-liquidity SMEs to use external financing.

Supporting *H6a* and *H6b*, the relationship between asset tangibility and STD is significantly negative, whereas the relationship between asset tangibility and LTD is significantly positive. This means that SMEs with high levels of tangibility tend to use less STD and more LTD than do other firms. In agreement with *H7a* and *H7b*, the fixed-effects model indicates that use of tax shields is significantly and negatively related to both STD and LTD. However, according to the OLS model, and in contrast to *H7a*, use of tax shields is significantly and positively related to STD. Finally, the OLS results suggest an industry effect on the debt ratios.

Overall, the OLS and fixed-effects models provide evidence at the 1 per cent level of a positive relationship between size and growth, respectively, and STD, and a negative relationship between age, profitability, liquidity and asset tangibility, respectively, and STD. Regarding tax shields, the OLS model indicates a positive association with STD, whereas the fixed-effects model indicates a negative association with STD. Moreover, the OLS and fixed-effects models provide evidence of a positive relationship between growth and asset tangibility, respectively, and LTD, and a negative relationship between size, profitability, liquidity and tax shields, respectively, and LTD. Regarding age, the OLS model indicates a positive association with LTD, whereas the fixed-effects model indicates a negative association with LTD. The industry variable is significantly associated with both SDT and LTD.

The results of the hypothesis tests are summarized in Table V. Note that for a hypothesis to be rejected, it is sufficient if just one of the two models indicates an insignificant result. When comparing how the determinants affect STD and LTD, respectively, Table V shows that profitability and liquidity are negatively related to both STD and LTD, whereas growth is positively related to the two dependent variables. Industry sector affects STD and LTD. The remaining determinants affect STD and LTD, not only differently but also in four different ways. Size is positively related to STD, but negatively related to LTD. Age is negatively related to STD, but unrelated to LTD. Asset tangibility is negatively related to

| Independent variables | STD | | LTD | |
|---|---|---|---|---|
| | OLS | Fixed-effects | OLS | Fixed-effects |
| Constant | 0.263 | 0.234 | 0.119 | 0.209 |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.004 | 0.011 | 0.004 | 0.01 |
| Size | 0.007** | 0.035** | −0.002** | −0.003** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.0000 | 0.001 | 0.000 | 0.001 |
| Age | −0.034** | −0.100** | 0.004** | −0.047** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.001 | 0.002 | 0.001 | 0.002 |
| Growth | 0.003** | 0.001** | 0.001** | 0.001** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.001 | 0.000 | 0.000 | 0.000 |
| Profitability | −0.049** | −0.073** | −0.059** | −0.042** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.003 | 0.003 | 0.003 | 0.002 |
| Liquidity | −0.061** | −0.038** | −0.135** | −0.008** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.003 | 0.003 | 0.002 | 0.003 |
| Tangibility | −0.181** | −0.093** | 0.150** | 0.157** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.003 | 0.004 | 0.002 | 0.004 |
| Tax shield | 0.392** | −0.026** | −0.118** | −0.027** |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Std. err. | 0.000 | 0.011 | 0.011 | 0.011 |
| Indus. | 0.027** | | −0.002** | |
| *P* | (0.000) | | (0.000) | |
| Std. err. | 0.013 | | 0.000 | |
| DW test | 1.562 | | 1.746 | |
| VIF | 1.15 | | 1.167 | |
| $F$ ($\chi^2$) | 1,216.211 | 474.41 | 1,698.644 | 498.94 |
| *P* | (0.000) | (0.000) | (0.000) | (0.000) |
| Hausman ($\chi^2$) | | 1,426.5 | | 1,662.74 |
| *P* | | (0.000) | | (0.000) |
| Adj. $R^2$ | 0.118 | 0.074 | 0.176 | 0.038 |
| No. of obs. | 63,588 | 63,588 | 63,588 | 63,588 |

**Notes:** $*p < 0.05$; $**p < 0.01$; $STD_{i,t}$ = short-term debt, i.e. debt repayable within one year divided by total assets, book values; $LTD_{i,t}$ = long-term debt, i.e. debt repayable beyond one year divided by total assets, book values; $Size_{i,t}$ = the size of firm *i at time t*, the natural logarithm of net sales; $Age_{i,t}$ = firm age, the natural logarithm of the number of years since the firm was established as of the year of data collection; $Growth_{i,t}$ = the percentage change in sales; $Profitability_{i,t}$ = the profitability of firm *i at time t*, earnings after interest and tax divided by total assets; $Liquidity_{i,t}$ = the ratio of current assets to total assets; $Tangibility_{i,t}$ = asset tangibility divided by total assets; $Taxshields_{i,t}$ = non-debt tax shields, depreciation divided by total assets

**Table IV.**
Results of OLS and fixed-effects regressions (2009-2012)

STD, but positively related to STD. Use of non-debt tax shields is unrelated to STD, but negatively related to LTD.

## 5. Concluding remarks

Based on a comprehensive and cross-sectoral database, this study examined capital structure determinants among Swedish SMEs during a four-year period following the 2008

| Hypothesis | Test result | Relationship to STD | Relationship to LTD |
|---|---|---|---|
| *H1a* | Rejected | Size is positively related to STD | |
| *H1b* | Rejected | | Size is negatively related to LTD |
| *H2a* | Supported | Age is negatively related to STD | |
| *H2b* | Rejected | | Age is not related to LTD |
| *H3a* | Supported | Growth is positively related to STD | |
| *H3b* | Supported | | Growth is positively related to LTD |
| *H4a* | Supported | Profitability is negatively related to STD | |
| *H4b* | Supported | | Profitability is negatively related to LTD |
| *H5a* | Supported | Liquidity is negatively related to STD | |
| *H5b* | Supported | | Liquidity is negatively related to LTD |
| *H6a* | Supported | Asset tangibility is negatively related to STD | |
| *H6b* | Supported | | Asset tangibility is positively related to LTD |
| *H7a* | Rejected | Use of non-debt tax shields is not related to STD | |
| *H7b* | Supported | | Use of non-debt tax shields is negatively related to LTD |
| *H8a* | Supported | Industry is related to STD | |
| *H8b* | Supported | | Industry is related to LTD |

**Table V.**
Hypothesis testing

**Note:** The hypotheses are rejected if they are rejected by one of the models (OLS or fixed effects)

financial crisis. At an overall level, the descriptive statistics indicate that the average total leverage ratio among the sampled SMEs is less than 35 per cent, indicating that the firms rely relatively more on internal than external financing. Related to this, the negative relationship between profitability and STD and LTD, respectively, suggests that retained earnings in terms of profitability constitute a preferred substitute for external financing. The same preference for internal financing holds for high-liquidity SMEs. Moreover, the sampled firms use more STD than LTD. In fact, the small proportion of LTD relative to other financing alternatives in the investigated firms indicates that accessing LTD may have been a challenge for Swedish SMEs in the aftermath of the financial crisis – a pattern previously found by Proença *et al.* (2014) in Portuguese firms – and that STD was a substitute for LTD (Hall *et al.*, 2000; Michaelas *et al.*, 1999; Petersen and Rajan, 1997) irrespective of firm characteristics or industry affiliation. As emphasized by Yazdanfar and Öhman (2015), the use of STD rather than LTD can also be a strategy to decrease the costs related to information asymmetry and agency conflicts.

Taken together, eight independent variables were tested as determinants of STD and LTD. The results indicate that STD is positively related to size and growth and negatively related to age, profitability, liquidity and asset tangibility. LTD is positively related to growth and asset tangibility, and negatively related to size, profitability, liquidity and non-debt tax shields. However, the results regarding the relationship between STD and non-debt tax shields, and between LTD and age, are not consistent when using OLS and fixed-effects regressions.

In several ways, the current study supports the findings of previous studies (López Gracia and Sogorb Mira, 2008; Mac an Bhaird and Lucey, 2010, 2014; Serrasqueiro and Caetano, 2015). However, regarding the influence of size on STD and LTD, the current results are in contrast to results reported by Chittenden *et al.* (1996), Esperança *et al.* (2003), Hall *et al.* (2004), Psillaki and Daskalakis (2009) and Yazdanfar and Ödlund (2010). A possible reason for the current results, which suggest a positive relationship between size and STD and a negative relationship between size and LTD, is that larger SMEs used STD as a substitute for LTD in the aftermath of the financial crisis. Changed firm financing behaviour related to the financial crisis has been reported by Proença *et al.* (2014) in the Portuguese context and by Ghosh (2015) in the Indian context.

The current study has a number of limitations. One of them concerns the generalization of the results. The sampled SMEs operate in five industries, indicating that the extent to which the results can be generalized to other industries or to the SME sector as a whole can be questioned. The lack of extensive data on the years before 2009 prevented us from investigating the SME capital structure determinants over a longer time horizon, particularly before the financial crisis. In line with Mac an Bhaird and Lucey (2014), we also acknowledge that SME financing behaviour is context dependent and heterogeneous across countries.

The study has several implications for SME owners and managers, as well as for financial institutions. According to Vanacker *et al.* (2011), knowledge of SME financing is still limited. The current results can thus help improve awareness of the determinants of SME capital structure, thereby promoting more effective use of financial resources. As SMEs' capital structure is suggested to influence their performance and value in various contexts (Weill, 2008), SME owners and managers may find the current results useful with regards to debt policy. STD and LTD seem to be linked to several of the explanatory variables in various ways. It also seems as though small, young, low-liquidity SMEs with low collateral ratios suffer the most from information asymmetry. These SMEs may benefit from starting to cooperate with banks in the earlier stages of their life cycles to create track records and good reputations. Such close cooperation may help SMEs and banks reduce problems related to information asymmetry and agency conflicts.

Given that SME capital structure and financing behaviour are significant bases for credit policy formulation, the current results could also be useful for regulators. As a lack of suitable financing sources has been one problem facing SMEs, particularly during and after the financial crisis, it could be beneficial to encourage the development of new and flexible financing products to stimulate the role of SMEs in job creation and economic development.

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