The impact of trade credit use on firm profitability: empirical evidence from Sweden

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Abstract

Purpose – The purpose of this paper is to examine the impact of trade credit as a funding source on profitability among small and medium-sized enterprises (SMEs).

Design/methodology/approach – A large cross-sectional panel data set covering 15,897 Swedish SMEs in five industry sectors from 2009 to 2012 was analysed using several statistical techniques.

Findings – The study provides empirical evidence that the use of trade credit significantly and negatively affects firm profitability, indicating that SMEs with lower accounts payable are more profitable. Furthermore, liquidity level and firm size are positively related to profitability, while firm age is negatively related to profitability.

Practical implications – If firms rely, or are forced to rely, too heavily on accounts payable as a funding source, their long-term profitability could be jeopardized. An efficient financing policy should make the costs related to the use of trade credit more transparent. Thus, firm managers could explicitly use trade credit agreements with their suppliers to control the costs related to this particular financial source.

Originality/value – To the authors' knowledge, this study is the first to focus on the impact of trade credit on profitability in the Swedish context, where SMEs are encouraged to use trade credit as a funding source. In addition, the study is based on an extensive sample of SMEs across several industry sectors.

Keywords Profitability, Sweden, SMEs, Financial performance, Financial management, Trade credit use

Paper type Research paper

1. Introduction

Trade credit has been recognized as a crucial source of short-term financing for small and medium-sized enterprises (SMEs) (Berger and Udell, 2006; Danielson and Scott, 2004; Peel *et al.*, 2000; Seifert *et al.*, 2013; Wilson and Summers, 2002). A trade credit contract is a legally binding agreement between two parties that allows a buyer to purchase goods or services on account and pay the supplier at a later date. The buyer considers the agreement a financing tool, and trade credit appears as a current liability on that firm's balance sheet. From the supplier perspective, the agreement is regarded as an investment in accounts receivable and appears as an asset on that firm's balance sheet.

The present study highlights the buyer side (i.e. the demand side) of trade credit as a financing tool. If the use of trade credit gives better access to external capital or lowers the cost of capital, it gives the buyer a comparative advantage in the product market. Ferris (1981) found that trade credit can reduce transaction costs by allowing firms to pay bills periodically. Using trade credit also allows the buyer to confirm product quality before paying (Deloof and Jegers, 1999; Pike *et al.*, 2005). At the same time, trade credit is considered more expensive than bank loans due to the additional costs of premiums (Burkart and Ellingsen, 2004; Cuñat, 2007; Jain, 2001; Petersen and Rajan, 1997; Wilner, 2000).

Unlisted firms in European countries with less-developed stock markets for SMEs tend to rely relatively greatly on debt capital (Giannetti, 2003). However, since SMEs are generally regarded as facing higher information asymmetry and higher bankruptcy risk than do larger companies, SMEs' interest rates can be considerably higher (Beck, 2007). The relationship between SMEs and banks in such environments has been described as problematic (Binks *et al.*, 2006), and SMEs are encouraged to use trade credit and other short-term financing because these financial sources often do not involve any demand for collateral (Yazdanfar, 2012).

The links between trade credit and profitability have attracted researcher attention (e.g. Bougheas *et al.*, 2009). Empirical results are not unanimous, and previous studies have mostly examined listed or large companies (e.g. Deloof, 2003; Gill *et al.*, 2010; Lazaridis and Tryfonidis, 2006; Samiloglu and Demirgunes, 2008) or companies within a single industry sector (e.g. Gill *et al.*, 2010; Samiloglu and Demirgunes, 2008). Moreover, although trade credit is a common funding source and a significant area of financial management even among Swedish firms, no empirical research has examined this issue using Swedish data. Aiming to fill this gap, the present study examines whether trade credit and the control variables liquidity, size, age, and industry affiliation affect small firm profitability in Sweden. Although the basic conditions are similar in most European countries, the Swedish context differs somewhat from others, as Sweden has a small, export-oriented open economy with universal social benefits funded by high taxes (Swedish Central Bank, 2013). Moreover, Sweden is still one of the member states of the European Union having its own national currencies and is not part of the euro area.

The present study's main contribution is that it provides additional empirical evidence regarding the outcome of trade credit use. Unlike most previous research, it statistically analyses data covering a large cross-sectoral sample of SMEs. The remainder of the paper is structured as follows. Section 2 presents the theoretical framework and reviews previous empirical studies. Section 3 describes the variable selection, data sample, and model specification, while the next section presents the empirical results. The paper ends with a concluding discussion.

2. Theoretical framework and previous empirical studies
2.1 Theoretical framework
Several overlapping theoretical approaches have been developed to explain the use of trade credit, often classified as operational, commercial, or financial (Garcia-Teruel and Martinez-Solano, 2010; Martinez-Sola *et al.*, 2014). According to the operational approach, firms use trade credit to achieve cost efficiency by separating the delivery of goods from related payments (Wilson and Summers, 2002), which creates greater certainty for both buyer and supplier. This means that the parties can anticipate product and payment flows and be more flexible with regard to variation in demand (Emery, 1984). In line with the commercial approach, trade credit can be used to stimulate sales, enabling the buyer to pay later, and confirm the quality of the goods before paying (Lee and Stowe, 1993; Long *et al.*, 1993). Accordingly, trade credit can be used to establish beneficial long-term business relationships (Ng *et al.*, 1999; Petersen and Rajan, 1997; Wilson and Summers, 2002). The financial approach suggests that market imperfections make it easier and cheaper for suppliers rather than buyers to access capital (Garcia-Teruel and Martinez-Solano, 2010; Petersen and Rajan, 1997; Wilner, 2000). Biais and Gollier (1997) demonstrated that the use of trade credit may make it easier for firms experiencing financial constraints to access capital instead of

using other funding sources. However, since buyers must pay the implicit cost of capital financing (Cuñat, 2007; Giannetti *et al.*, 2011; Martinez-Sola *et al.*, 2014), trade credit will be the choice if there are no better and cheaper funding alternatives (Deloof and Van Overfelt, 2008).

Berger and Udell (2006) demonstrated that SMEs' access to external financial resources is influenced by three challenges associated with information asymmetry: high-verification costs, adverse selection, and moral hazard. In agreement with pecking order theory, these challenges force new firms to follow a hierarchy in raising capital. If possible, they use internal rather than external capital sources (Petersen and Rajan, 1997). More precisely, these firms prefer to finance new investments, first, using internal funds, followed by short-term debt, risky debt, and finally new shareholder equity. Firms that face high levels of credit rationing from banks are more likely than other firms to use trade credit as a financing option (Giannetti *et al.*, 2011). Petersen and Rajan (1997) demonstrated that if firms face credit rationing, trade credit will be an attractive financing option even if it is costly. Rodriguez-Rodriguez (2006) and Bougheas *et al.* (2009) confirmed that reductions in bank loans will increase the amount of trade credit.

Danielson and Scott (2004) argued that since smaller firms face more obstacles to obtaining credit from banks, they tend to need more trade credit than do larger firms. Consequently, volume of purchases has been identified as an important determinant of trade credit demand (Elliehausen and Wolken, 1993). While Petersen and Rajan (1997) suggested that trade credit and bank loans would be substitutes for each other, Burkart and Ellingsen (2004) instead described the relationship between these financing sources as complementary. In addition, Wilson and Summers (2002) demonstrated that the use of trade credit is significantly affected by industry sector characteristics.

2.2 Empirical studies of the relationship between trade credit use and firm profitability
In accordance with the purpose of this study, this section highlights empirical research into trade credit as a funding source and its relationship to firm profitability. Deloof (2003) studied a sample of 1,009 large Belgian non-financial firms for the 1992-1996 period, applying correlation and regression analysis. The results indicated a significant negative relationship between trade credit (i.e. accounts payable) and profitability in terms of gross operating income, the firms financed with trade credit tending to be less profitable. Similarly, using correlation and regression analysis, Lazaridis and Tryfonidis (2006) investigated the impact of accounts payable on profitability among 131 firms operating in various industry sectors listed on the Greek Stock Exchange for the 2001-2004 period. Based on multiple regression analysis, the results suggested a significant negative relationship.

Garcia-Teruel and Martinez-Solano (2007) applied multiple regression analysis and fixed-effects estimation as a control method to a large data set covering 8,872 Spanish SMEs for the 1996-2002 period to analyse the effect of working capital management on profitability. The authors found that accounts payable significantly and negatively affected profitability. Samiloglu and Demirgunes (2008) also used multiple regressions to examine the effect of working capital on profitability in a sample of 5,843 Turkish manufacturing firms listed on the Istanbul Stock Exchange for the 1998-2007 period. In that case as well, the empirical findings indicated a negative relationship between trade credit (i.e. accounts payable) and profitability. The same result was found by Gill *et al.* (2010), who used OLS regression and correlation coefficient methods to analyse 88 American manufacturing firms listed on the New York Stock Exchange for the 2005-2007 period. Several recent studies from different countries confirm a negative

relationship between using trade credit as a financial source and firm profitability (e.g. Jacobson and von Schedvin, 2015; Pais and Gama, 2015; Yazdanfar and Öhman, 2015).

Bougheas *et al.* (2009) employed the generalized method of moments to analyse a sample of UK manufacturing firms represented by 56,432 observations over the 1993-2003 period. Their findings suggested that profitability is positively related to accounts payable. In the same vein, Makori and Jagongo (2013) found a positive relationship between account payable and profitability among manufacturing and construction firms listed on the Nairobi Stock Exchange. These findings are inconsistent with the results of most other studies in the field of working capital and trade credit.

In sum, previous studies have been based on various sample selections, have examined firms operating in various contexts, and have analysed the data in various ways. As noted, certain aspects make the Swedish business environment and economic structure partly non-comparable with conditions elsewhere. However, trade credit does give rise to capital costs, and previous findings are relatively consistent regarding the effects of such costs. The main hypothesis is, therefore, formulated as follows:

H1. Trade credit use is negatively related to firm profitability.

3. Selection of variables, data sample, and model specification
3.1 Selection of variables
The dependent variable, profitability, can be defined in various ways. Based on previous studies (e.g. Deloof, 2003; Lazaridis and Tryfonidis, 2006) earnings before interest and taxes (EBIT) is used as a proxy, and profitability is defined as EBIT in proportion of the total assets. The independent variable, trade credit, is proxied by accounts payable (cf. Deloof, 2003; Garcia-Teruel and Martinez-Solano, 2007; Lazaridis and Tryfonidis, 2006; Samiloglu and Demirgunes, 2008) and defined as the ratio of accounts payable to total assets.

Accounts payable might overlap with other variables, and liquidity level, firm size, and firm age are, therefore, used as control variables. Access to liquidity is an important precondition for investment and firm profitability (Goddard *et al.*, 2005; Maçãs Nunes *et al.*, 2012). A similar view emphasizes the dependence of profitability on resource availability (Yazdanfar, 2013). The existence of a liquidity constraint on SMEs has been explained by capital market imperfections (Myers and Majluf, 1984). In the present study, the liquidity level is defined as the ratio between current assets and total assets, and the hypothesis is formulated as follows:

H2. Liquidity is positively related to profitability.

The link between a firm's size and its creditworthiness has been recognized (e.g. Rajan and Zingales, 1995), and firm size has generally been assumed to be important in explaining profitability. However, previous empirical studies do not agree regarding the relationship between size and profitability. Some studies have found a significant positive relationship between the two variables (Asimakopoulos *et al.*, 2009; Claver *et al.*, 2002; Gschwandtner, 2005), while others have found an inverse relationship (Dhawan, 2001; Goddard *et al.*, 2005; Pi and Timme, 1993).

Several proxies, such as total assets, turnover, and number of employees, have been used for firm size in previous studies. Niskanen and Niskanen (2006), Petersen and Rajan (1997), and Vaidya (2011) proxied firm size using total assets, while Garcia-Teruel and Martinez-Solano (2007) and Pike *et al.* (2005) used turnover as a measure of size. As recommended by Coad (2009), the present study measured firm size as the natural logarithm of the firm's book value of sales (i.e. turnover).

Since previous findings are ambiguous, the present study bases the hypothesis below on the fact that economies of scale are beneficial (Ravenscraft and Scherer, 1987) and that small firms are often less diversified, to experience higher income volatility, and to have a higher probability of failure than large firms (e.g. Rajan and Zingales, 1995). The hypothesis is accordingly as follows:

H3. Firm size is positively related to profitability.

Firm age is considered to affect both profitability and account payable. However, the results of previous empirical studies concerning the association between age and profitability are contradictory. Garcia-Teruel and Martinez-Solano (2007) found a positive relationship between age and profitability, while Yazdanfar (2013) and Yazdanfar and Öhman (2014) found an opposite relationship between the variables among Swedish SMEs. Following the latter studies, the present study measured firm age as the natural logarithm of the number of years since the firm's establishment, and the hypothesis is formulated as follows:

H4. Firm age is negatively related to profitability.

The relationship between trade credit and firm profitability may vary systematically by industry affiliation (Fishman and Love, 2003). The profitability level of an industry can be dependent on a number of variables, such as access to debt capital, technology type, costs related to labour, and capital. The profitability level can also change over time, reflecting possible changes in various variables over time (Yazdanfar, 2013). The industry effects are controlled for to identify industry-specific differences. A categorical variable was used as dummy for each industry sector, and the hypothesis is as follows:

H5. Industry affiliation is related to profitability.

3.2 Data sample
Firm-level financial data were collected from the Affärsdata database, which contains data from the financial statements of Swedish firms. Due to the lack of data from before 2009, and because most firms were still drawing up their 2013 financial statements at the time of data collection, this study focuses on the 2009-2012 period. To avoid sampling bias, firms for which there were missing values, outliers, and/or inconsistent figures were deleted from the sample. Previous studies have defined SMEs in various ways. This study employs the Statistics Sweden (2012) definition of SMEs, so the target population comprised all non-financial SMEs with 1-199 employees and in operation at the end of 2012 in the five selected industry sectors. The sample covered 15,897 SMEs for which there was complete information for the 2009-2012 period, resulting in a data panel with 63,588 observations. The industry classification is based on the Swedish Standard Industry Classification (SNI) codes.

3.3 Model specification
Following the vast majority of previous studies, and to test the explanatory power of the independent variable and the control variables for firm profitability, a multiple OLS model (1) was estimated for the sample as follows:

$$Profitability_{i,t} = \alpha_t + \beta_1 Accounts\ payable_{i,t} + \beta_2 Liq_{i,t}$$

$$+ \beta_3 Size_{i,t} + \beta_4 Age_{i,t} + \beta_5 Indus_{i,t} + \mu_{it} \qquad (1)$$

where α_t is the constant; *Accounts payable*$_{i,t}$, is the ratio of accounts payable to total assets; $Liq_{i,t}$ the liquidity ratio between current and total assets; $Size_{i,t}$ the size of firm i at time t (measured as the natural logarithm of the firm's book value of sales); $Age_{i,t}$, the natural logarithm of the number of years since the firm's establishment; $Indus_{i,t}$, a categorical variable as dummy for each industry sector according to Swedish Standard Industry Classification (SIC) at the one-digit level, and μ is the error term.

The two-stage least squares (2SLS) regression was implemented to address the endogeneity problem. In line with previous studies (Garcia-Teruel and Martinez-Solano, 2010; Martinez-Sola *et al.*, 2014) two instrument variables, accounts receivable and short-term debt, were employed. To examine endogeneity and robustness of using these variables, the Durbin and Wu-Hausman and the Sargan and Basmann statistics were performed. The results of these testes are presented in Table III.

The equations of the 2SLS model (2) and (3) are as follows:

$$Accounts\ payable = \alpha_t + \beta_1 Liq_{i,t} + \beta_2 Size_{i,t} + \beta_3 Age_{i,t}$$
$$+ \beta_4 Indus_{i,t} + \beta_5 AR_{i,t} + \beta_6 STD_{i,t} + \mu_{it} \qquad (2)$$

$$Profitability_{i,t} = \alpha_t + \beta_1 accounts\ payable_{i,t} + \beta_2 Liq_{i,t}$$
$$+ \beta_3 Size_{i,t} + \beta_4 Age_{i,t} + \beta_5 Indus_{i,t} + \mu_{it} \qquad (3)$$

where all parameters are similar to those in the first model (1); and the instrumental variables AR and STD account for account receivable and short-term debt.

To test the stability of the results of the OLS and 2SLS models, random-effects and fixed-effects regressions were applied for the total sample in agreement with to the following equations:

$$Profitability_{i,t} = \alpha_t + \beta_1 Accounts\ payable_{i,t} + \beta_2 Liq_{i,t}$$
$$+ \beta_3 Size_{i,t} + \beta_4 Age_{i,t} + \eta_i + \mu_{it} \qquad (4)$$

$$Profitability_{i,t} = \alpha_t + \beta_1 Accounts\ payable_{i,t} + \beta_2 Liq_{i,t}$$
$$+ \beta_3 Size_{i,t} + \beta_4 Age_{i,t} + \eta_i \qquad (5)$$

4. Empirical results

4.1 Descriptive statistics

The descriptive statistics are summarized in Table I. The distribution of firms across industry sectors indicates that 43 per cent of all sampled SMEs are categorized as retail firms, and that 18 per cent each are wholesale and metal firms. The remaining firms are in health care and construction. The mean profitability is 12 per cent, with a standard deviation of 16 per cent. On average, trade credit amounts to 11 per cent of total firm assets, with a standard deviation of 10 per cent. The mean liquidity level is approximately 0.25, although this differs considerably between industry sectors. While the health care sector has the highest liquidity level, wholesale has the lowest. The mean number of employees per firm is ten, but the standard deviation is high, 18 per cent, indicating that the number of employees in the SMEs varies widely across the five industry sectors. The wholesale firms have 16 employees each on average, while the corresponding number in the health

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Industry	Profitability	Trade credit	Liquidity	Size	Age	Employees	Account receivable (IV)	Short-term debt (IV)
Retail								
Mean	0.11	0.14	0.248	8.98	22.04	7.98	0.08	0.23
SD	0.13	0.10	0.209	1.26	15.24	13.70	0.12	0.13
n (firms)	6,754	6,754	6,754	6,754	6,754	6,754	6,754	6,754
% total	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
n (observations)	27,016	27,016	27,016	27,016	27,016	27,016	27,016	27,016
Wholesale								
Mean	0.09	0.12	0.152	9.80	25.37	16.30	015	0.19
SD	0.17	0.10	0.181	1.60	17.47	26.23	0.18	0.12
n (firms)	2,890	2,890	2,890	2,890	2,890	2,890	2,890	2,890
% total	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
n (observations)	11,560	11,560	11,560	11,560	11,560	11,560	11,560	11,560
Metal								
Mean	0.11	0.09	0.219	9.09	23.84	13.60	0.21	0.32
SD	0.15	0.07	0.208	1.32	14.99	20.95	0.13	0.15
n (firms)	2,808	2,808	2,808	2,808	2,808	2,808	2,808	2,808
% total	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
n (observations)	11,232	11,232	11,232	11,232	11,232	11,232	11,232	11,232
Health care								
Mean	0.25	0.02	0.41	7.86	15.31	3.24	0.07	0.21
SD	0.20	0.04	0.25	0.81	9.48	6.13	0.09	0.11
n (firms)	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795
% total	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
n (observations)	7,180	7,180	7,180	7,180	7,180	7,180	7,180	7,180
Construction								
Mean	0.11	0.11	0.31	8.52	19.28	7.00	0.23	0.37
SD	0.18	0.09	0.23	1.29	12.57	13.62	0.18	0.17
n (firms)	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650
% total	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
n (observations)	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600
Total								
Mean	0.12	0.11	0.25	8.98	21.92	9.85	0.25	0.25
SD	0.16	0.10	0.22	1.41	15.13	17.97	0.14	0.15
n (observations)	63,588	63,588	63,588	63,588	63,588	63,588	63,588	63,588
n (firms)	15,897	15,897	15,897	15,897	15,897	15,897	15,897	15,897
ANOVA								
F	1,410.88**	2,263.06**	1,916.89**	2,715.98**	13,215.53	900.30**	2,837.20	3,069.5**
Sig.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: *,**Coefficients are significant at the 0.05 and 0.01 level, respectively

Table I.
Summary of descriptive statistics for industry sector and total sample levels (for the 2009-2012 period)

care firms is three. The instrumental variables, account receivable, and short-term debt, vary considerable among industry sectors.

The ANOVA results indicate significant differences between industry sectors with respect to profitability and trade credit ratios. Health care firms are the most profitable on average with a mean return rate of 25 per cent, while the least profitable industry sector is wholesale with a mean profitability of 9 per cent. On average, firms in the retail sector appear to have the highest trade credit ratios at 14 per cent, while health care firms have the lowest at 2 per cent.

Concerning the volatility of the variables, the results suggest that profitability has high volatility as its standard deviation is above the mean. The variables trade credit and size display rather low volatility. Further analyses were conducted to test the differences in the mean values of the variables across industry sectors using ANOVA. All the variables differed significantly between the industry sectors at the 5 per cent significance level, implying that the sample is fairly heterogeneous.

4.2 Correlation analysis

Correlation analysis was performed to identify the relationship between the variables, and to examine any multicollinearity between them. As the results in Table II indicate, the proxy for profitability (i.e. EBIT in proportion of total assets) is negatively and significantly related to the level of trade credit (i.e. accounts payable) and firm age at the 1 per cent significance level, while the proxy for profitability is positively and significantly related to liquidity, firm size, account receivable, and short-term debt at the same significance level.

The significant relationship between trade credit and each of firm size and firm age at the 1 per cent significance level suggests that the larger and older the firm, the higher its level of trade credit. At the same time, the liquidity ratio is negatively

Variables	Profitability	Trade credit	Liquidity	Size	Age	Accounts receivable (IV)	Short-term debt (IV)
Profitability	1	–0.125**	0.261**	0.023**	–0.172**	0.042**	0.037**
Sig.		0.000	0.000	0.000	0.000	0.000	0.000
Trade credit	–0.125**	1	–0.190**	0.285**	0.060**	0.124**	0.134**
Sig.	0.000		0.000	0.000	0.000	0.000	0.000
Liquidity	0.261**	–0.190**	1	–0.262**	–0.091**	0.038**	0.017**
Sig.	0.000	0.000		0.000	0.000	0.000	0.000
Size	0.023**	0.285**	–0.262**	1	0.145**	0.004	0.0005**
Sig.	0.000	0.000	0.000		0.000	0.267	0.000
Age	–0.172**	0.060**	–0.091**	0.145**	1	–0.210**	–0,256**
Sig	0.000	0.000	0.000	0.000		0.000	0.000
Accounts receivable (IV)	0.042**	0.124**	0.038**	0.004	–0.210**	1	0.308**
Sig.	0.000	0.000	0.000	0.267	0.000		0.000
Short-term debt (IV)	0.037**	0.134**	0.017**	–0.005**	–0,256**	0.308**	1
Sig.	0.000	0.000	0.000	0.000	0.000	0.000	
N	63,588	63,588	63,588	63,588	63,588	63,588	63,588

Note: *,**Coefficients are significant at the 0.05 and 0.01 level, respectively

and significantly related to trade credit, meaning that SMEs with higher liquidity ratios tend to have smaller total accounts payable. In addition, the instrumental variables are positively related to accounts payable. As all the coefficients are fairly low, there is no risk of multicollinearity among the independent variable and control variables.

4.3 The results of OLS, 2SLS, random-effects, and fixed-effects models
Table III summarizes the results of the OLS, 2SLS, random-effects, and fixed-effects analyses of the complete sample, modelling the relationship between the variables. According to the tests of Durbin and Wu-Hausman, the results of OLS suffer from endogeneity problem. However, the 2SLS model was performed to overcome this problem. According to the results of the 2SLS and consistent with *H1*, the accounts payable ratio significantly and negatively affects profitability at the 1 per cent level significance level ($\beta = -0.222$; $p < 0.01$), meaning that SMEs with higher accounts payable ratios will be less profitable. In agreement with *H2*, the liquidity coefficient is positively and significantly related to profitability, indicating that firms with better access to cash are more likely to achieve higher profitability levels ($\beta = 0.185$; $p < 0.01$). In line with *H3*, size significantly and positively affects profitability ($\beta = 0.018$; $p < 0.01$), indicating that larger firms tend to be more profitable than smaller ones. Moreover, the impact of age on profitability is negative, supporting *H4* ($\beta = -0.027$; $p < 0.01$). Finally, consistent with *H5*, industry affiliation significantly influences firm profitability ($\beta = 0.006$; $p < 0.01$). The results of the random-effects and fixed-effects analyses are consistent with the results of 2SLS, and based on Hausman test it can be concluded that fixed-effects is an appropriate model.

The 2SLS analysis further indicates that accounts payable and liquidity level have the highest β values, $\beta = -0.222$ and $\beta = 0.185$, respectively, implying that these financial predictors have a stronger influence on firm profitability than does size, age, or industry affiliation. The R^2 statistic indicates that the model explains approximately 12 per cent of the change in the profitability ratio, which indicates that other variables, such as managerial factors and macroeconomic factors (e.g. interest rates), affect the dependent variable. The validity tests of the model, including the Wu-Hausman and Durbin, and the Sargan and Basmann tests, confirm that the robustness of using the 2SLS and the fixed-effects models.

To sum up, the results confirm that trade credit, liquidity level, and firm size are predictors of SME profitability. The impact of trade credit in terms of accounts payable on profitability is consistent with previous results, including those of Deloof (2003), Garcia-Teruel and Martinez-Solano (2007), Gill *et al.* (2010), Lazaridis and Tryfonidis (2006), and Samiloglu and Demirgunes (2008). However, the magnitude of the impact varies between contexts and estimation methods. The positive affect of liquidity level on profitability supports evidence provided by Goddard *et al.* (2005) and Maçãs Nunes *et al.* (2012). The result regarding the positive relationship between firm size and profitability is in line with those of Asimakopoulos *et al.* (2009), Claver *et al.* (2002), and Gschwandtner (2005), but in contrast to those of Dhawan (2001), Goddard *et al.* (2005), and Pi and Timme (1993). Moreover, the finding that firm age is negatively and significantly related to profitability, supports the findings of Yazdanfar and Öhman (2014), but not the findings of Garcia-Teruel and Martinez-Solano (2007). Lastly, the fact that industry affiliation affects profitability is consistent with Yazdanfar's (2013) findings.

Model variables	OLS (1) profitability	Model variables	First equation 2SLS (2) Trade credit	Second equation 2SLS (3) profitability	Model variables	Random-effects (4) profitability	Fixed-effects (5) profitability
Constant	−0.006	Constant	0.012**	0.007**	Constant	0.054**	−0.033**
p-value	0.432	p-value	0.000	0.000	p-value	0.000	0.003
SE	0.005	SE	0.003	0.005	SE	0.006	0.011
Trade credit	−0.156**	Trade credit		−0.222**	Trade credit	−0.194**	−0.156**
p-value	0.000	p-value		0.000	p-value	0.000	0.000
SE	0.007	SE		0.026	SE	0.007	0.010**
Liquidity	0.188**	Liquidity	−0.042**	0.185**	Liquidity	0.188**	0.206**
p-value	0.000	p-value	0.000	0.000	p-value	0.000	0.000
SE	0.003	SE	0.002	0.003	SE	0.003	0.004
Size	0.018**	Size	0.014**	0.018**	Size	0.024**	0.035**
p-value	0.000	p-value	0.000	0.000	p-value	0.000	0.000
SE	0.005	SE	0.001	0.001	SE	0.000	0.001
Age	−0.027**	Age	0.003	−0.027**	Age	−0.054**	−0.068**
p-value	0.000	p-value	0.000	0.000	p-value	0.000	0.000
SE	0.001	SE	0.000	0.001	SE	0.001	0.003
Industry	0.008**	Industry	−0.018**	0.006**			
p-value	0.000	p-value	0.000	0.000			
SE	0.000	SE	0.000	0.005			
		Accounts receivable (IV)	0.094**		Wald χ^2	6,889.69	
		p-value	0.000		Wald (sig.)	0.000	
		SE	0.002		Hausman test χ^2	360.54	
		Short-term debt (IV)	0.110**		Hausman test (sig.)	0.000	
		p-value	0.000		F test χ^2		1,000.28
		SE	0.000		F (sig.)		0.000
Adj. R^2	0.1175	Adj. R^2	0.1851	0.1162	Adj. R^2	0.0724	0.0946
F-value	1,693.60	F-value χ^2	2,408.00	7,976.53	F-value		3.30
Prob. $> \chi^2$	0.000	p-value	0.000	0.000	Prob. $> \chi^2$	0.000	0.000
No. of obs.	63,588	No. of obs.	63,588	63,588	No. of obs.	63,588	63,588
Root MSE	0.15406	Root MSE	0.0885	0.15418			
Mean VIF	1.132						
Tests of endogeneity							
Durbin (score)			$\chi^2 = 6.65$	$p = 0.009$			
Wu-Hausman			$\chi^2 = 6.65$	$p = 0.009$			
Instrument validity test							
Sargan (score)			$\chi^2 = 1.0351$	$p = 0.3089$			
Basmann $\chi^2(1)$			$\chi^2 = 1.0350$	$p = 0.3090$			

Note: **Coefficients are significant at the 0.01 level

Table III.
Summary of
regression
estimations for the
complete sample (for
the 2009-2012 period)

5. Concluding remarks, practical implications, limitations, and future research

This study examines an issue relevant to firm owners, managers, and debt holders and it may facilitate further research in similar areas of managerial finance. The analysis of an extensive sample of Swedish SMEs in five industry sectors suggests that the use of trade credit (i.e. accounts payable) as a funding source have a significant negative influence on firm profitability. Whereas trade credit and firm age negatively influences profitability, liquidity level, and firm size positively influence profitability. All in all, the findings indicate that larger and younger SMEs with low levels of trade credit and high liquidity access are more likely to be profitable than are other SMEs. Although, some coefficients vary between industry sectors, the general conclusions hold for all five sectors investigated.

The present results are important for at least two reasons. First, they confirm findings of most previous studies of the effect of trade credit on profitability conducted in other countries and contexts. Second, in contrast to most previous studies they are based on an extensive sample of SMEs across several industry sectors. The study also has a number of managerial implications. The results indicate that the use of accounts payable as a financing tool, like any other financial source, is associated with advantages and disadvantages. Firms that face high financial constraints often view trade credit as an attractive financing option even though it is costly (Giannetti *et al.*, 2011; Petersen and Rajan, 1997), and SMEs tend to rely relatively greatly on accounts payable as a way to overcome credit and liquidity constraints (Yazdanfar, 2012). These firms should be aware of the implicit costs of such financing in terms of decreased profitability. Given that the use of accounts payable affects firm profitability and value, increased effort to achieve optimal credit management policy could be crucial. If firms rely, or are forced to rely, too much on trade credit as a funding source, their long-term performance could be jeopardized. SMEs may wish to reduce trade credit to an optimum level by, for example, decreasing the cash conversion cycle (Yazdanfar and Öhman, 2014). Firm managers may also explicitly use trade credit agreements with their suppliers to control the costs related to that financial source (Jain, 2001).

A number of limitations encountered in this study can be regarded as indicating directions for future research. This study sample is, admittedly, limited to SMEs in five industry sectors operating in Sweden, so the present findings may not be directly generalizable to large companies or to include SMEs in other industry sectors and countries. To minimize the risk of sample bias, future studies could increase the number of industry sectors to offset the structure of the whole population. This suggestion for further research is in line with Wilson and Summers (2002), who found that trade credit use is significantly affected by industry sector characteristics. Due to data limitations, a limited number of explanatory variables were used in the present study. For example, this study has not controlled for managerial factors or macroeconomic factors (e.g. interest rates were extremely low in Sweden during the studied period). Future researchers could, therefore, increase the number of independent variables. To minimize the time effect, future research could also cover a longer period of time. This study has highlighted the demand side of trade credit, and, consequently, it has not considered the possibility that accounts payable and accounts receivable could influence each other. Regardless of these limitations, the results provide additional insights into the impact on small firms' profitability and survival capacity of using trade credit as a funding source.

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