Trade credit, firm profitability, and financial constraints: Evidence from listed SMEs in East Asia and the Pacific.

Cong Huan, Hoang; Xiao, Qin; Akbar, Saeed

Abstract

Purpose –The principal objective of this study is to investigate the non-linear association between trade credit and profitability of small and medium enterprises (SMEs). Moreover, this paper analyses whether the above relationship varies according to financial constraints of SMEs.

Design/methodology/approach – The authors use panel data methodology to conduct investigations for a sample of 1,509 non-financial listed SMEs from nine countries or territories located in the East Asia and Pacific region, namely, China, Vietnam, Malaysia, Thailand, Japan, South Korea, Taiwan, Singapore and Hong Kong, over the period from 2010 to 2016.

Findings –This study indicates that trade credit receivable (TCR) and trade credit payable (TCP) have an inverted U-shaped relationship with SMEs' profitability, which implies the existence of an optimal trade credit level that balances between costs and benefits to maximize their profitability. This result suggests that managers should try to keep the level of trade credit investment as close to the optimal point as possible to avoid the case that their profitability reduces when they move away from this point. Moreover, this study also finds that the optimal trade credit level is sensitive to the financial constraints of SMEs. In particular, optimal level of more financially constrained firms is lower than that of less financially constrained firms.

Originality/value – A number of contributions that this study makes to the existing literature are presented as follows. First, the paper takes account of the possible presence of a concave relationship between trade credit and SMEs' profitability, largely ignored by the existing empirical literature. Second, it demonstrates this association in terms of both aspects of trade credit, including trade credit receivable (TCR) and trade credit payable (TCP). Third, the study investigates the effect of the different level of financial constraints faced by SMEs on the relationship between trade credit and their profitability.

Keywords Small and Medium Enterprises (SMEs), Trade credit, Profitability, East Asia and the Pacific, Financial constraints, Profitability.

Paper type Research paper

This is the accepted manuscript of an article published in International Journal of Managerial Finance

1. Introduction

Trade credit is a financing instrument offered by suppliers to their customers (Cheng and Pike, 2003; Lin and Chou, 2015). The efficiency of trade credit management is essential in corporate financing policy because it impacts on risks and performance of firms (Lewellen et al., 1980; Hill et al., 2012). A wealth of empirical studies have explored the vital role of trade credit control through demonstration of its impacts on firms' profitability (Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Kestens et al., 2012; Martínez-Sola et al., 2014; Abuhommous, 2017). In general, those studies have found a linear correlation between the two variables, but this linearity divides researchers into two opposing camps. According to the view of one camp, the profitability of a firm will improve if it steps up investment in trade credit. The opposite camp maintains that high investment in trade credit is related to high risk of revenue loss or high financial costs, and hence reduces firm profitability. These controversial findings suggest that trade credit may have a non-linear rather than a linear relationship with firm profitability. If so, there may exist an optimal trade credit level which maximizes corporate profitability.

Some existing studies on working capital management reveal evidence of a non-linear relationship between firms' investment in working capital and their profitability (Baños-Caballero et al., 2012; 2014; Mun and Jang, 2015; Afrifa, 2016; Afrifa and Padachi, 2016). For instance, by using the cash conversion cycle as a measure of working capital, Baños-Caballero et al. (2012) and Afrifa and Padachi (2016) point towards the existence of a concave relationship between these two variables in Spain and the UK respectively. However, the limitation of those studies is that they only refer to working capital management in general, rather than focus on individual components of working capital, such as trade credit receivable and trade credit payable. Understanding the roles of these individual components is step forward worth pursuing.

To our best knowledge, only a few studies so far have quested after a potential non-linear connection between trade credit and firm performance, but none in the East Asia and Pacific context (Martínez-Sola et al., 2013b; Pais and Gama, 2015; Lyngstadaas and Berg, 2016). Although their findings are quite insightful, these studies have some limitations. Martínez-Sola et al. (2013b) provide evidence to support an inverted U-shaped association between these two variables in Spain, but they were concerned about firm value rather than firm profitability. Furthermore, their study pays particular attention to investment in accounts receivable while leaving out accounts payable. Nevertheless, the usage of trade credit is twofold (Petersen and Rajan, 1997). A firm can be viewed as a customer; hence, its accounts payable (TCP) is a proxy

for how much it borrows from its suppliers. In contrast, a firm is also a supplier, and accounts receivable (TCR) is its lending to customers (Petersen and Rajan, 1997). Both aspects of trade credit are important to firm performance and are interlinked with the necessity to finance production (Ferrando and Mulier, 2013). Consequently, this study treats the firm first as a supplier (lender) and then a customer (borrower) to evaluate the critical role of trade credit to its profitability. Moreover, Martínez-Sola et al. (2013b) focus on large firms rather than small and medium-sized enterprises (SMEs). Trade credit, however, is of particular importance to SMEs (Petersen and Rajan, 1997). According to García-Teruel and Martínez-Solano (2007), these firms have constrained access to external financing, so they face a lack of finance for their growth. This difficulty stems from the asymmetry of information between the firm and the capital market. The insufficient information decreases the market's ability to assess the firm's projects and raises its cost of external financing (Baños-Caballero et al., 2014). The use of trade credit allows SMEs greater access to funds, because of the comparative advantage of commercial creditors in the control and evaluation of credit risk (Schwartz, 1974; Emery, 1984). Thus, financial constraints faced by SMEs play a key role in trade credit investment decisions. Recently, Pais and Gama (2015) and Lyngstadaas and Berg (2016) overlook this crucial feature when they demonstrate a non-linear relationship between trade credit and profitability of SMEs in Portugal and Norway respectively. Their results nevertheless suggest that the relationship between these two variables is convex rather than concave.

To fill the gaps discussed above, the objective of this study is to investigate a non-linear relationship between trade credit and profitability of SMEs，with both aspects of trade credit (TCR and TCP) considered. In addition, given that financial constraints of SMEs play a crucial role in trade credit investment decisions, this study investigates the possible influence of their financing constraints on the above relationship.

For these purposes, this paper uses a sample of 1,509 non-financial listed SMEs from nine countries or territories located in East Asia and the Pacific – China, Vietnam, Malaysia, Thailand, Japan, South Korea, Taiwan, Singapore and Hong Kong. This region is selected for several reasons. Firstly, East Asia and the Pacific has experienced rapid economic growth and has functioned as an engine of growth for the global economy (Asian Development Bank, 2014). Secondly, SMEs face great hurdles in accessing formal finance in economies around the world, but the challenge is the greatest in this area. According to Stein et al. (2013), seventeen million formal SMEs worldwide report that their demand for financial access is underserved or unserved by the formal financial sector, with eight million of these located in

East Asia and the Pacific. The share of the SMEs justifies our selection of the region. Thirdly, the East Asia and Pacific region consists of forty countries but only these nine countries or territories have well developed public equity markets for SMEs (The World Bank, 2018). Although some other nations in this area also have SME boards, the number of listed firms is too small. For example, Cambodia Securities Exchange (CSX) was established in 2011 but has only two companies listed in total (Asian Development Bank, 2015). Finally, SMEs in these countries have shown a rising trend in both trade credit receivable (TCR) and trade credit payable (TCP) from 2010 to 2016. Figure 1 demonstrates that the TCR reached approximately 0.39 in 2011 from 0.25 in 2010. It decreased to 0.3 in 2012 before recovering steadily afterwards. The figure also shows that TCP remained quite stable and stayed below bank loans from 2010 to 2014. Since then, it increased significantly, exceeding the latter after 2015. Such change offers us an excellent opportunity to examine our objectives set out above.

[Insert Figure 1 here]

Findings of this study indicate that TCR and TCP have an inverted U-shaped relationship with SMEs' profitability in the countries or territories examined. That is, investment in trade credit has a positive relationship with firm profitability at lower levels of trade credit; but this association becomes negative at higher levels. Consequently, there exists an optimal trade credit level at which SMEs can maximize profitability. In addition, when firms are classified into two groups according to their cash flow and external financing cost, designed to calculate the level of financial constraints, this study finds that both less and more financially constrained firms face a concave association between trade credit and profitability, but their optimal levels of trade credit differ. In particular, the less financially constrained firms have a higher optimal level than the more financially constrained firms.

A number of contributions that this study makes to the existing literature are presented as follows. First, the study offers new evidence on the influence of trade credit on firms' profitability, by taking account of the possible existence of a concave association between trade credit and profitability. This is largely overlooked by the existing empirical literature. Second, this study considers both aspects of trade credit, including trade credit receivable (TCR) and trade credit payable (TCP). Third, this study investigates how the relationship between trade credit and SMEs' profitability varies according to their financial constraints.

The remainder of this paper is organised into five sections. The second section contains theoretical foundations and hypothesis development; the third describes the data and regression

models; the fourth carries out the analyses and provides an explanation of the empirical results, and the fifth reports robustness and endogeneity check. The final section is conclusions.

2. Theoretical foundations and hypothesis development

2.1. Trade credit and firm profitability

Trade credit is a commercial credit that occurs when a vendor sells his merchandise on credit, instead of requiring immediate payment (Preve and Sarria-Allende, 2010). Firms have the motivation to offer more trade credit to their customers, mainly because it may increase firms' sales, and can consequently lead to higher profitability (Martínez-Sola et al., 2014).

Furthermore, the incentive of firms to hold positive trade credit receivable arises from a number of advantages. Firstly, trade credit allows buyers to evaluate product quality before making payment, so it alleviates the information asymmetry between suppliers and buyers (Long et al., 1993). If customers are not satisfied with the quality, they can return the product without payment (Smith, 1987). Accordingly, trade credit can also be viewed as an implicit quality guarantee and helps a firm to strengthen its long-term relationship with the customers (Deloof and Jegers, 1996). Secondly, trade credit allows firms to have a flexible approach to pricing (Brennan et al., 1988). By adjusting either the discount for prompt payment or the credit period, they can sell merchandise at various prices (Brennan et al., 1988). Thirdly, more trade credit reduces the storage costs for supplier firms because it encourages customers to acquire more products (Ferris, 1981). Finally, trade credit is also treated as a short-term investment whereby the granting firm can increase revenue through the implicit interest rates incentive (Emery, 1984; Neale and Shipley, 1985).As a consequence of these benefits, this study expects that the profitability of a firm increases with an increase in its trade credit receivable. Nevertheless, high accounts receivable is also linked to possible adverse effects, which may lower firm profitability. According to Petersen and Rajan (1997), granting more trade credit exposes a firm to the financial risks of no payment or late payment from customers. In order to limit this problem, the firm will incur high administrative costs for assessing credit risk and structuring delayed payment contracts (Kim and Atkins, 1978; Emery, 1984). Furthermore, a high provision of trade credit locks up a large amount of money in accounts receivable (Nadiri, 1969). This might hamper firms' ability to take up value-enhancing investment projects because of insufficient funds. In this case, the firm may be forced to obtain additional funds at extra costs from the capital market (Watson and Head, 2010). Based on the above discussions, it might be argued that the costs of investment in accounts receivable surpass its benefits, and hence, if a firm keeps high levels of receivables, it will receive lower profit.

The conflicting views on trade credit decision suggest that this decision may involve a cost-benefit trade-off. Consequently, this study expects the existence of an optimal trade credit level at which a firm can balance costs and benefits to maximize profitability. Hypothesis 1 is presented as follows:

Hypothesis 1: Extending trade credit to customers has an inverted U-shaped relationship with SMEs' profitability.

Hypothesis 1A: Extending trade credit will positively impact on SMEs' profitability at lower levels of trade credit granted.

Hypothesis 1B: Extending trade credit will negatively impact on SMEs' profitability at higher levels of trade credit granted.

Not only do firms grant trade credit to customers, but they also demand trade credit from their own suppliers, generally by stretching payments (Deloof and Jegers, 1996; Berger and Udell, 1998; Wilner, 2000). By doing this, a firm might take full advantage of a better cash flow position for its operation (Petersen and Rajan, 1997). Also, trade credit can be considered as a short-term loan that sellers provide to buyers (Mian and Smith, 1992). For SMEs, trade credit from suppliers is widely used and presented as an essential portion of their finance (Demirgüç-Kunt and Maksimovic, 1999; Cunat, 2006). The reason is that these firms often have limited access to credit from traditional banks, and therefore, they tend to depend on trade credit payable as a substitute for bank loans (Berger et al., 2001; Fisman and Love, 2003; Love et al., 2007).

Apart from financial constraints, SMEs may have an incentive to receive trade credit because of its benefits. According to Van Horne and Wachowicz (2008), trade credit is readily available without a formal arrangement or contract. In addition, it is a flexible means of finance because firms do not need to pledge collateral, sign a note, or adhere to a strict payment schedule on a note (Huyghebaert, 2006; Van Horne and Wachowicz, 2008). Finally, trade credit can decrease payment transaction costs by separating the exchange of the product from the immediate use of money (Ferris, 1981). This can help firms to decrease precautionary cash holdings because they can anticipate their cash flow for payment and can manage their financial resources more efficiently. From the above discussion, the receipt of trade credit from suppliers helps SMEs to overcome their financial constraints. It guarantees that SMEs have enough cash flow for their operations. Thus, more trade credit payable can raise firms' profitability. On the other hand, stretching payment may also damage the long-term relationship between buyers and suppliers, and a firm may spend extra cost to find alternative suppliers (Cunat, 2006). If the firm habitually fails to make payment on time or stretches its payables excessively, its

suppliers will rank it as a low creditworthy customer. As a result, it will face difficult barriers to accessing the financial market in the future (Van Horne and Wachowicz, 2008). In the event of late payment, a supplier can stop the supply of the common good and raise the terms of trade credit contracts to disrupt the firm's business operation (Cunat, 2006). Moreover, Ng et al. (1999) also argue that by stretching payment, firms might not only lose the amount of discount for early payment but also pay the highest rate of interest for the use of these funds. As a result, trade credit is an expensive form of finance, and usage of it for short-term finance might lead to reduced firm profitability (Van Horne and Wachowicz, 2008).

Given the costs and benefits of trade credit payable, this study proposes that receipt of trade credit has a non-linear relationship with firm profitability. In particular, it proposes the following hypotheses:

Hypothesis 2: Receipt of trade credit by SMEs from their suppliers has an inverted U-shaped relationship with their profitability.

Hypothesis 2A: Receipt of trade credit will positively impact SMEs' profitabiliy at lower levels of trade credit received.

Hypothesis 2B: Receipt of trade credit will negatively impact SMEs' profitability at higher levels of trade credit received.

2.2. Investment in trade credit and financial constraints

Given that restriction on access to finance is more severe a problem for SMEs, this study expects that the optimal level of trade credit changes according to different levels of financing constraints faced by firms. According to Kim and Chung (1990), investment in accounts receivable is highly associated with the financing condition of firms. In this line, Petersen and Rajan (1997) show that the provision of trade credit is positively related to a firm's ability to access finance. Accordingly, firms with financial stability are inclined to offer more trade credit to their customers than firms suffering from financial constraints (Schwartz, 1974). Similarly, Meltzer (1960) indicates that firms with a larger capacity to generate internal cash flow and better access to capital market tend to offer more trade credit to their customers. Conversely, firms in financial distress will keep a lower level of trade credit provision (Molina and Preve, 2009). The reason is that such firms experience restricted access to the capital market and pay higher costs for raising external funds. In such situation, accounts receivable is seen as a cash management tool. Thus, more financially constrained firms may have a higher propensity to save cash from operating cash flows to ensure available source of internal finance for their investment opportunities, while less financially constrained firms do not (Acharya et al., 2007). Based on the above discussion, this study proposes the following hypothesis:

Hypothesis 3: More financially constrained companies will have a lower optimal level of trade credit receivable than less financially constrained companies.

In addition, Carbo-Valverde et al. (2016) suggest that receipt of trade credit is also sensitive to the financial constraints facing SMEs. A firm with the availability of cash flow often does not face financial constraints because it is less dependent on external funding (Afrifa, 2016). However, if the available cash flow is not sufficient to finance production, the firm must rely on external finance. Bank loans and trade credit are the two main alternatives of external funding, of which trade credit from suppliers is more expensive (Ng et al., 1999; Psillaki and Eleftheriou, 2015; Carbo-Valverde et al., 2016). More financially constrained firms tend to employ higher degree of trade credit from suppliers by postponing payment for raw materials (Petersen and Rajan, 1997). This leads to an increase in financial costs, and hence, those firms experience decreased profitability. Conversely, the availability of cash flow allows unconstrained firms to pay their suppliers in advance. This not only helps the firms to enhance the business relationship with their creditors but also gives them opportunities to benefit from discount policies in the future (Ng et al., 1999). Thus, unconstrained firms will enjoy more advantages of trade credit from creditors to improve their performance than financially constrained firms. From this discussion, this paper expects the following:

Hypothesis 4: More financially constrained companies will have a lower optimal level of trade credit payable than less financially constrained companies.

3. Data and regression models

3.1. Data and summary statistics

This study utilises panel data of SMEs for the seven-year period from 2010 to 2016. During this time, liquidity and financial constraints were raised amongst the SMEs in the aftermath of the 2008 financial crisis (Martínez-Sola et al., 2014). Such constraints should make the efficiency of trade credit management even more critical. The selection of SMEs is based on the following criteria. Firstly, these firms must be listed on the SME board of a public equity market in the East Asia - Pacific region. This sample covers nine countries or territories, including China, Vietnam, Malaysia, Thailand, Japan, South Korea, Taiwan, Singapore and Hong Kong. The selection of listed SMEs as a focus is because their financial statements are more accurate and more reliable than those of their non-listed counterparts. Secondly, these firms must meet the definition of small- and medium-sized enterprises (SMEs) set by each country (see Appendix A).

In addition to those selection criteria, this study applies a series of filters based on earlier studies (García-Teruel and Martínez-Solano, 2007; Pais and Gama, 2015; Lyngstadaas and

Berg, 2016). Specifically, firms with anomalies in their accounting data are also excluded. For instance, firms are excluded if their total assets, sales, trade credit receivable and trade credit payable have negative values, and if their total assets differ from total liabilities and equity. Financial firms are excluded from the sample because these firms have very different accounting requirements and asset structures from non-financial ones. The final sample consists of 1,509 non-financial listed SMEs, which amounts to an unbalanced panel of 10,537 firm-year observations. (Table 1).

[Insert Table 1 here]

The required financial and accounting firm-level data are retrieved from Bloomberg and DataStream Thomson One. The country-level data, such as Gross Domestic Product (GDP) growth is gathered from the World Bank database, but that of Taiwan is collected from National Statistics (2018). Further, both dependent and independent variables are winsorized at 5% and 95% to overcome the influence of outliers.

3.2. Variables and regression models

3.2.1. The non-linear relationship between trade credit and firm profitability

In order to check whether or not the relationship between trade credit and firm profitability is non-monotonic, this study builds two quadratic models as follows:

For trade credit receivable (TCR):

$$PRO_{it} = \beta_0 + \beta_1 TCR_{it} + \beta_2 TCR_{it}^2 + \beta_3 LEV_{it} + \beta_4 CASH_{it} + \beta_5 LIQ_{it} + \beta_6 ATAN_{it} + \beta_7 GROWTH_{it} + \beta_8 SIZE_{it} + \beta_9 INDUST_{it} + \beta_{10} GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

For trade credit payable (TCP):

$$PRO_{it} = \beta_0 + \beta_1 TCP_{it} + \beta_2 TCP_{it}^2 + \beta_3 LEV_{it} + \beta_4 CASH_{it} + \beta_5 LIQ_{it} + \beta_6 ATAN_{it} + \beta_7 GROWTH_{it} + \beta_8 SIZE_{it} + \beta_9 INDUST_{it} + \beta_{10} GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where PRO_{it} is the firm profitability; measured by the gross operating income (PRO_1) and the net operating income (PRO_2). Following Deloof (2003) and Baños-Caballero et al. (2012), this study uses these proxies because they are better than the Return on Assets (ROA) in reflecting the operational efficiency of firms. Moreover, two different measures of firm profitability are used in order to ascertain the robustness of the results.

The main independent variables are trade credit receivable (TCR), and trade credit payable (TCP). The square of trade credit receivable (TCR^2) and that of trade credit payable (TCP^2) are included in equations (1) and (2) as independent variables to test for non-linearity. Moreover, this study also includes control variables that impact on firm profitability based on earlier studies (Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Baños-Caballero et al., 2012; Martínez-Sola et al., 2014; Afrifa and Padachi, 2016). These include financial

leverage (LEV), cash ratio (CASH), liquidity ratio (LIQ), assets tangibility (ATAN), sales growth (GROWTH), firm size (SIZE), industry deviation (INDUST) and the growth rate of Gross Domestic Product (GDP). All variables are defined in Appendix B. According to Modigliani and Miller (1963), debt is the cheapest source of finance because of its lower cost and tax deductibility. Hence, this study expects that the association between LEV and SMEs' profitability is positive. Moreover, it is expected that there is a positive association between CASH and firm profitability, because high cash holdings can reduce firms' dependence on costly external financing and increase their likelihood of undertaking value-enhancing projects (Chen, 2008). Next, LIQ is expected to have a positive relationship with firm profitability because the availability of liquidity allows SMEs to have better control over their business operations. The relationship between ATAN and firm profitability is expected to be positive too. Firms holding more tangible assets can gain easy access to external finance from the capital market for their operations because those assets can be offered as good collaterals (Titman and Wessels, 1988; Rajan and Zingales, 1995; Himmelberg et al., 1999). GROWTH is also expected to have a positive association with firm profitability because a firm with high sales growth will utilise fully its capital to create more revenue, which results in higher profitability (Brush et al., 2000). Moreover, the study expects the relationship between firm size and profitability to be either way. While Yang and Chen (2009) find a negative relationship between firm size and firm performance, Berger and Ofek (1995) find a positive association. In addition, this study expects that GDP has a positive effect on the profitability of firms because firms will increase profitability significantly when they operate in countries with good economic conditions (Niskanen and Niskanen, 2006). To control for various industries, the variable INDUST is included in the model (Martínez-Sola et al., 2018). The parameter η_i is unobservable heterogeneity and λ_t controls for time impacts. Finally, ε_{it} is a random disturbance.

From equations (1) and (2), an optimal point is obtained by taking derivative of firm profitability (PRO) with respect to the trade credit variables (TCR and TCP) and setting this derivative to zero.

For trade credit receivable (TCR): $dPRO / dTCR = \beta 1 + 2\ \beta_2\ TCR$

The optimal point: $$TCR^* = - \beta_1 / (2\ \beta_2) \quad (3)$$

For trade credit payable (TCP): $dPRO / dTCP = \beta_1 + 2\ \beta_2\ TCP$

The optimal point: $$TCP^* = - \beta_1 / (2\ \beta_2) \quad (4)$$

To verify our main hypotheses, TCR* and TCP* should be positive and hence economically meaningful, this study requires β_2 to be negative when $\beta 1$ is positive.

In this study, all hypotheses are tested based on panel data regression. This is because it allows us to control for the presence of unobservable heterogeneity. Individuals or firms are heterogeneous, and their different characteristics are difficult to observe and hard to measure (Himmelberg et al., 1999). Hence, this method helps us to eliminate the risk of obtaining biased results arising from such heterogeneity (Hsiao, 1985). This study conducts a Hausman (1978) test to choose between Fixed Effect Model (FEM) and Random Effect Model (REM) under the null hypothesis of no correlation between the independent variables and the unobserved company heterogeneity (η_i) (Hausman, 1978). When the result of the Hausman test rejects this null hypothesis, it means that the REM is not preferred and the FEM is appropriate for this study (Brooks, 2008). Additionally, this study uses the Modified Wald test and the Wooldridge test to check heteroscedasticity and serial correlation respectively. If these two tests show the presence of these problems in the model, the study will estimate all models with robust standard errors.

3.2.2. Financial constraints affect the non-linear relationship between trade credit and firm profitability

This section will check whether or not the status of SMEs' financial constraints impacts on their optimal level of trade credit. Following Baños-Caballero et al. (2014) and Afrifa (2016), cash flow ratio is used as a proxy for the existence of financial constraints and to classify firms because it reflects the ability of firms to generate internal resources (Afrifa, 2016). When a firm has a cash flow below the sample median, it is expected to be more likely to face financing constraints. This ratio is calculated as the ratio of earnings before interest and tax plus depreciation to total assets.

Moreover, this study also categorizes firms according to the cost of external financing, calculated as the ratio of financial expenses to total debt (Baños-Caballero et al., 2014). Firms with the cost of external financing above the sample median are considered financially constrained. Otherwise, they are less likely to face financial constraints. Hence, using two different proxies for the existence of financing constraints verifies the robustness of the results.

For this purpose, two models are represented as follows:

For trade credit receivable (TCR):

$$PRO_{it} = \beta_0 + (\beta_1 + \alpha_1 FC_{it})TCR_{it} + (\beta_2 + \alpha_2 FC_{it})TCR_{it}^2 + \beta_3 LEV_{it} + \beta_4 CASH_{it} + \beta_5 LIQ_{it} + \beta_6 ATAN_{it} + \beta_7 GROWTH_{it} + \beta_8 SIZE_{it} + \beta_9 INDUST_{it} + \beta_{10} GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it,} \quad (5)$$

For trade credit payable (TCP):

$$PRO_{it} = \beta_0 + (\beta_1 + \alpha_1 FC_{it})TCP_{it} + (\beta_2 + \alpha_2 FC_{it})TCP_{it}^2 + \beta_3 LEV_{it} + \beta_4 CASH_{it} + \beta_5 LIQ_{it} + \beta_6 ATAN_{it} + \beta_7 GROWTH_{it} + \beta_8 SIZE_{it} + \beta_9 INDUST_{it} + \beta_{10} GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (6)$$

where all independent and dependent variables are defined in Appendix B. FC is a dummy variable representing financial constraints. For more financially constrained firms, it takes a value of 1. Otherwise, its value is zero. According to equations (5) and (6), the optimum of less constrained firms is - β_1/ 2β_2 while that of more constrained firms is – (β_1 + α_1) / 2 (β_2 + α_2).

4. Analysis and results

4.1. Descriptive statistics and correlation analysis

Table 2 reports the descriptive statistics of all variables in this research. It shows that the mean value of gross operating income (PRO_1) and that of net operating income (PRO_2) are similar, 20.73% and 17.97% respectively. On the other hand, the mean value of TCR (0.2487) is much higher than that of TCP (0.0805), implying that SMEs on average are more likely to extend rather than receiving trade credit. Their average debt level (LEV) is low and they tend to hold high level of cash (CASH) and liquid assets (LIQ) , all pointing to the presence of financial constraints. They also have low average fixed asset (ATAN) hence low capacity to borrow, which perhaps explains their low debt level. Their average annual sales growth (GROWTH) is rather impressive (10.77%), but the average GDP growth across these nine countries or territories is a modest 4.45%. With the exception of firm size (SIZE), all averages are higher than the medians, hence the sample has a skewed distribution. The large standard deviations arises from the fact that these firms are drawn from different countries or territories which have different definitions of SMEs.

[Insert Table 2 here]

In Table 3, this paper reports the correlations among all variables considered in this study. The purpose of this analysis is to identify the presence of multi-collinearity in regression analysis. According to Brooks (2008), high correlations between the independent variables and dependent variables do not cause multi-collinearity. However, high correlations among independent variables suggest that the model is suffering from multi-collinearity. This problem occurs in the regression analysis only if the correlation coefficient between the independent variables is higher than 0.80 or 0.90 (Field, 2009). As can be seen in Table 3, none of the correlations among the independent variables exceeds these thresholds.

[Insert Table 3 here]

4.2. The non-linear relationship between trade credit and firm profitability

Before providing an explanation of results, this paper conducts a Hausman (1978) test to choose between the FEM and the REM. In Table 4, the p-value of the Hausman test is significant at the 1 per cent level, and hence, the FEM is an appropriate model. Moreover, the

p-value of the Modified Wald test and that of the Wooldridge test are significant at the 1 per cent level. These results indicate the presence of heteroscedasticity and autocorrelation in the FEM. For this reason, all models in this research are estimated with robust standard errors.

Table 4 contains the estimated results of the influence of TCR and TCP on firm profitability. The dependent variable in Columns 1 and 2 is gross operating income (PRO_1), and that in Columns 3 and 4 is net operating income (PRO_2). The signs of TCR and TCR^2 are unchanged for the two alternative proxies of firm profitability. The coefficient of TCR is positive and significant at the 1 per cent level in both Columns 1 and 3, while that of TCR^2 is negative and significant at the 1 per cent level. This finding is consistent with our expectation that TCR has an inverted U-shaped relationship with firm profitability. This means that there exists an optimal level of TCR at which SMEs can balance between costs and benefits to maximize their profitability. From Table 4, the coefficient of TCR has a value of 0.187, and the coefficient of TCR^2 is -0.292 when gross operating income (PRO_1) is used. According to formula (3), the optimal TCR is (-0.187) / 2 x (-0.292) = 0.320. High investment in TCR up to this point increases sales, thereby raises profitability. After this point, profitability decreases with TCR because of the adverse effect of financial risk. The optimal TCR changes only slightly, from 0.320 to 0.312 when gross operating income is replaced by net operating income as a measure of profitability.

In Columns 2 and 4, the coefficient of TCP is statistically significant and positive and its square is statistically significant and negative at the 1 per cent level for the two different measures of firm profitability. This finding confirms that there is an inverted U-shaped relationship between TCP and firm profitability, which is consistent with our expectation. The coefficient of TCP has a value of 0.919 and the coefficient of TCP^2 is -2.361 when gross operating income (PRO_1) is used as a proxy for firm profitability. According to formula (4), the optimal level of TCP is at 0.195. Below this point, the benefits of receipt of trade credit dominate the costs, hence TCP impacts positively on firms' profitability. Conversely, when firms have trade credit level above this optimum, the effects of financial costs dominate the benefits, and therefore, TCP has a negative impact on profitability. The optimal TCP rises only slightly to 0.202 when net operating profit is used in place of gross operating profit.

[Insert Table 4 here]

Among the control variables, the impacts of LEV, CASH, ATAN and GROWTH are all positive and significant at the 1 per cent level and their magnitudes close. The significance of CASH perhaps explains why LIQ is mostly insignificant as the two are close substitutes. On

top of these, both INDUST and GDP have large and significant explanatory power for firm profitability.

4.3. Trade credit and firm profitability under financial constraints

Table 5 shows the regression results for less and more financially constrained firms categorized according to cash flow and external financing cost. The results show a non-linear relationship between trade credit and profitability for both more and less financially constrained firms for the two alternative proxies of firm profitability. The less financially constrained firms have large positive and significant coefficients of TCR and TCP ($\beta_1 > 0$) at the 1 per cent level in all classifications used. Their coefficients of TCR^2 and TCP^2 are negative and significant ($\beta_2 < 0$) at the 1 per cent level and large in magnitude. The results show the presence of a concave relationship between trade credit and profitability for these firms. On the other hand, for more financially constrained firms, while their coefficients of TCR and TCP are still positive ($(\beta_1 + \alpha_1) > 0$) and those of TCR^2 and TCP^2 are negative ($(\beta_2 + \alpha_2) < 0$), the absolute value of these coefficients are much smaller. The F_1 tests for the coefficients of TCR and TCP (i.e. $(\beta_1 + \alpha_1)$) and F_2 tests for the coefficients of TCR^2 and TCP^2 (i.e. $(\beta_2 + \alpha_2)$) are mostly significant, confirming the concave relationship for the more financially constrained firms.

With all measures of financial constraints and profitability, the optimal TCR level for more constrained firms is lower than that for the less constrained, which is consistent with intuition. For instance, with gross operating income as dependent variable and the cash flow used as a proxy for financial constraints, the coefficient of TCR has a value of 0.307 and that of the TCR^2 is -0.328 for less financially constrained firms. Thus, the optimal TCR for less financially constrained firms (FC = 0) is 0.468. For more financially constrained firms (FC=1), the value of coefficient of TCR is 0.061 and that of coefficient of TCR^2 is -0.185. Hence, the optimal TCR is a much lower 0.165. When external financing cost is used to classify the firms and the gross operating income is still used as a proxy for profitability, the difference is much smaller but the optimal TCR for more constrained firm (0.319) is still lower than that for the less constrained (0.352). A similar pattern emerged when net operating income is used as a profit proxy.

Similarly, the estimation suggests that the optimal level of TCP is lower for the more constrained firms than for the less constrained ones. For instance, with cash flow as a classification factor, the optimal TCP of the more constrained firms is 0.231 when gross operating income is used as a profit proxy and 0.260 when net operating income is used. The corresponding numbers for their less constrained counterpart are 0.444 and 0.463 respectively.

Again, when external financing cost is used as a classification factor, the optimal TCP is closer between the two types of firms although it is still lower for the more constrained firms. The optimal TCP is also lower across the board compared to the conclusion reached when cash flow is used as a classification factor. For example, these numbers are 0.189 and 0.188 respectively for the more constrained firms when gross operating income and net operating income are used in turn as profit proxy. The corresponding number for the less constrained are 0.196 and 0.194.

In all, the less financially constrained firms have both higher level of optimal trade credit receivable and trade credit payable than the more constrained ones regardless which proxy is used for financial constraints and which for profit. The level of optimality does change with the proxy choice but this central message is unaltered.

[Insert Table 5 here]

5. Robustness and endogeneity check

5.1. Deviation from the optimal trade credit level

The above results show the existence of an optimal trade credit which maximizes the profitability of SMEs. However, firms often cannot accurately estimate their optimal trade credit level because of the effects of some factors that change over time, such as opportunity cost of capital, the rate of customer default, or bad debt on their trade credits (Nadiri, 1969). Consequently, firms may estimate the trade credit level below or above their optimal point.

In this section, this study checks for robustness the earlier result by identifying association between deviations on both sides of the optimal trade credit level and firm profitability. If there exists an optimal point, any above-optimal or below- optimal deviation from this point will reduce the profitability of a firm. Based on Baños-Caballero et al. (2012), this paper employs a two-stage methodology as follows to test for robustness:

Stage 1: This study follows the previous studies of García-Teruel and Martínez-Solano (2010a), and García-Teruel and Martínez-Solano (2010b) to identify the determinants of both trade credit receivable (TCR) and trade credit payable (TCP).

For trade credit receivable (TCR):

$$TCR^*_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 STDEBT_{it} + \beta_4 TURN_{it} + \beta_5 CFLOW_{it} + \beta_6 GROF_{it} + \eta_i + \lambda_t + v_{it} \quad (7)$$

For trade credit payable (TCP):

$$TCP^*_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 STDEBT_{it} + \beta_4 LTDEBT_{it} + \beta_5 TURN_{it} + \beta_6 CFLOW_{i,t} + \beta_7 CASH_{it} + \eta_i + \lambda_t + v_{it} \quad (8)$$

where TCR* is the optimal trade credit receivable, which is measured as accounts receivable ÷ sales. TCP* is the optimal trade credit payable, which is calculated as accounts payable ÷ total assets. Firm size (SIZE) is the natural logarithm of total assets. Sales growth (GROWTH) is measured as ($Sales_t$ – $Sales_{t-1}$) ÷ $Sales_{t-1}$. Short-term finance (STDEBT) is calculated as short-term financial debt ÷ total assets. Long-term finance (LTDEBT) is calculated as long-term debt ÷ total assets. Product quality (TURN) is measured by total sales ÷ (total assets - accounts receivable). Cash flow (CFLOW) is calculated as (net income + depreciation) ÷ total sales. Cash ratio (CASH) is calculated as (cash + cash equivalents) ÷ total assets. Profit margin (GROF) is calculated by gross profit ÷ sales. The parameter η_i is unobservable heterogeneity. λ_t controls for time effects and v_{it} is random disturbance.

Stage 2: From equations (7) and (8), residuals are obtained and considered as a proxy for the deviations from the optimal point. These residuals are defined as DEVIATION_TCR for trade credit receivable and DEVIATION_TCP for trade credit payable. Both variables are included in equations (1) and (2) after excluding TCR, TCR^2, TCP, and TCP^2 to investigate how these deviations from the optimal trade credit level impact on firms' profitability. Two models are built as follows:

For trade credit receivable (TCR):

$$PRO_{it} = \alpha_0 + \alpha_1 DEVIATION\_TCR_{it} + \alpha_2 LEV_{it} + \alpha_3 CASH_{it} + \alpha_4 LIQ_{it} + \alpha_5 ATAN_{it} + \alpha_6 GROWTH_{it} + \alpha_7 SIZE_{it} + \alpha_8 INDUST_{it} + \alpha_9 GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (9)$$

For trade credit payable (TCP):

$$PRO_{it} = \alpha_0 + \alpha_1 DEVIATION\_TCP_{it} + \alpha_2 LEV_{it} + \alpha_3 CASH_{it} + \alpha_4 LIQ_{it} + \alpha_5 ATAN_{it} + \alpha_6 GROWTH_{it} + \alpha_7 SIZE_{it} + \alpha_8 INDUST_{it} + \alpha_9 GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (10)$$

where all independent variables and dependent variables are defined in Appendix B. In equations (9) and (10), it is expected that the value of α_1 is below zero as deviations from the optimum negatively affect firm profitability.

To test our hypotheses, this study further analyses the influence of both deviations, including below and above optimal trade credit level, on firm profitability. In order to fulfill this purpose, the paper identifies the variable INTERACT_TCR for trade credit receivable and INTERACT_TCP for trade credit payable and adds them to equations (9) and (10). The equations are formulated as follows:

For trade credit receivable (TCR):

$$PRO_{it} = \alpha_0 + \alpha_1 DEVIATION\_TCR_{it} + \alpha_2 INTERACT\_TCR_{it} + \alpha_3 LEV_{it} + \alpha_4 CASH_{it} + \alpha_5 LIQ_{it} + \alpha_6 ATAN_{it} + \alpha_7 GROWTH_{it} + \alpha_8 SIZE_{it} + \alpha_9 INDUST_{it} + \alpha_{10} GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (11)$$

For trade credit payable (TCP):

$$PRO_{it} = \alpha_0 + \alpha_1 DEVIATION\_TCP_{it} + \alpha_2 INTERACT\_TCP_{it} + \alpha_3 LEV_{it} + \alpha_4 CASH_{it} + \alpha_5 LIQ_{it} + \alpha_6 ATAN_{it} + \alpha_7 GROWTH_{it} + \alpha_8 SIZE_{it} + \alpha_9 INDUST_{it} + \alpha_{10} GDP_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (12)$$

where INTERACT_TCR is DEVIATION_TCR * above-optimal deviation, and INTERACT_TCP is DEVIATION_TCP * above-optimal deviation. The above-optimal deviation is a dummy variable, and it takes a value of 0 for negative residual and 1 otherwise. In equations (11) and (12), α_1 and $(\alpha_1 + \alpha_2)$ represent the impact of below-optimal deviation and above-optimal deviation on firm profitability respectively. If the actual trade credit level is lower than the optimal, the above-optimal deviation will be equal to 0 and α_1 accounts for its effect on firm profitability. Otherwise, the above-optimal deviation will be equal to 1, and $(\alpha_1 + \alpha_2)$ accounts for the effect. When a firm has an optimal point of trade credit, both above-optimal and below-optimal deviations decrease the firm profitability. Therefore, the study expects the values of α_1 and $(\alpha_1 + \alpha_2)$ to be both negative.

Table 6 displays the change of firm profitability when trade credit deviates from the optimal level for two alternative measures of firm profitability. Columns 1, 3, 5 and 7 display results without differentiating the differing effects of below- and above-optimum. The coefficients of DEVIATION_TCR and DEVIATION_TCP are negative and statistically significant at the 1 per cent level ($\alpha_1 < 0$). These results are consistent with our expectation that deviations from optimal trade credit decrease firm profitability. Columns 2, 4, 6 and 8 separate a potential asymmetric effect between below- and above-optimum deviations. In Columns 2 and 6, the coefficient of DEVIATION_TCR is negative and significant, but that of INTERACT_TCR is statistically insignificant. On the other hand, DEVIATION_TCP is negative and statistically significant while INTERACT_TCP positive and significant when both measures of profitability are employed. According to Martínez-Sola et al. (2013a), INTERACT_TCR and INTERACT_TCP could be negative or positive. However, the most important point here is that the sum of the coefficients $\alpha_1 + \alpha_2$ remains negative and statistically significant. In Columns 2, 4, 6 and 8, the sum of the coefficients $\alpha_1 + \alpha_2$ is negative, and the F-test shows that the sum of these two coefficients is statistically significant. In line with our expectation, above-optimal and below-optimal deviations decrease firm profitability.

Finally, the findings above further confirm the existence of an optimal trade credit level which maximizes SMEs' profitability. If firms move away from this point, their profitability will decrease. Managers of SMEs should therefore try to keep their trade credit level as close to the optimal point as possible.

[Insert Table 6 here]

5.2. The speed of adjustment of SMEs to the optimal trade credit level

With the existence of an optimal trade credit in SMEs, it is interesting to find out whether or not SMEs adjust their trade credit level towards the optimum; and if so how speedily. Following Baños-Caballero et al. (2013) and García-Teruel and Martínez-Solano (2010a), the partial adjustment models are presented as follows:

For trade credit receivable (TCR):

$$TCR_{it} - TCR_{it-1} = \gamma (TCR^*_{it} - TCR_{it-1}) + \varepsilon_{it} \quad (13)$$

For trade credit payable (TCP):

$$TCP_{it} - TCP_{it-1} = \gamma (TCP^*_{it} - TCP_{it-1}) + \varepsilon_{it} \quad (14)$$

where $(TCR^*_{it} - TCR_{it-1})$ and $(TCP^*_{it} - TCP_{it-1})$ show the adjustment required to reach the optimal level. TCR^*_{it} is the optimal point of trade credit receivable and TCP^*_{it} is the optimal point of trade credit payable. These two variables are estimated using Equations (7) and (8). The coefficient γ measures the rate of adjustment of firms to the optimal point, and it takes a value between 0 and 1. If γ is equal to 0, firms do not modify their existing level of trade credit perhaps because of high cost of adjustment. If it is 1, firms adjust trade credit level towards the optimal point immediately.

Substituting (7) and (8) into (13) and (14), we obtain the new equations as follows:

For trade credit receivable (TCR)

$$TCR_{it} = \alpha + \delta_0 TCR_{it-1} + \delta_1 SIZE_{it} + \delta_2 GROWTH_{it} + \delta_3 STDEBT_{it} + \delta_4 TURN_{it} + \delta_5 CFLOW_{it} + \delta_6 GROF_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (15)$$

For trade credit payable (TCP):

$$TCP_{it} = \alpha + \delta_0 TCP_{it-1} + \delta_1 SIZE_{it} + \delta_2 GROWTH_{it} + \delta_3 STDEBT_{it} + \delta_4 LTDEBT_{it} + \delta_5 TURN_{it} + \delta_6 CFLOW_{i,t} + \delta_7 CASH_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (16)$$

where $\alpha = \beta_0\gamma$; $\delta_0 = (1 - \gamma)$; $\delta_k = \gamma\beta_k$; η_i is unobservable heterogeneity. λ_t are time dummy variables; and $\varepsilon_{it} = \gamma v_{it}$. If the value of coefficient δ_0 is higher, this indicates a lower adjustment speed.

The estimation results are presented in Table 7 which shows that the coefficients of the lagged trade credit receivable (TCR) and the lagged trade credit payable (TCP) are both positive and significant at the 1 per cent level. The coefficient of the lagged TCR is 0.189, so the adjustment coefficient of TCR (γ) is 0.811. Similarly, the coefficient of the lagged TCP is 0.159, indicating the adjustment coefficient of TCP (γ) is 0.841. These results indicate that the speed of adjustment of firms to their optimal point is relatively high.

[Insert Table 7 here]

5.3. Endogeneity

Previous studies indicate that the problem of potential endogeneity could seriously impact on the estimation outcomes hence financial decisions (Martínez-Sola et al., 2014; Pais and Gama, 2015; Lyngstadaas and Berg, 2016). This problem arises because it is possible that the association between investment in trade credit and firm profitability reflects a bi-directional influence between profitability and trade credit investment. To control for this problem, this study resorts to instrumental variables method to estimate equations (1), (2), (5), and (6). In particular, the first lag of the independent variables TCR and TCP are used as instrumental variables.

As shown in Table 8, the coefficients of TCR and TCP are positive and significant ($\beta_1 > 0$), while those of TCR^2 and TCP^2 are negative and significant ($\beta_2 < 0$) for the two alternative proxies of firm profitability. Hence, the instrumental variable estimation results do not alter the earlier conclusion that there exists an invested U-shaped relationship between trade credit and SMEs' profitability, although the sizes of the coefficients do change a little.

Table 9 shows that less and more financially constrained firms have significant and positive coefficients of TCR and TCP in all the classifications used. Their coefficients of TCR^2 and TCP^2 are negative and significant. Thus, the results again confirm that these firms have a concave relationship between trade credit and firm profitability.

When cash flow is used as a proxy for financial constraints and gross operating income is used as a proxy for firm profitability, the optimal point of TCR appears at 0.376, and that of TCP is 0.167 for less financially constrained firms. On the other hand, for more financially constrained firms, the optimal points of TCR and TCP are 0.131 and 0.034, respectively. When external financing costs is used to classify firms, the optimal points of TCR are 0.310 and 0.223 for less and more financially constrained firms respectively. The optimal point of TCP is 0.160 for less financially constrained firms and 0.133 for more financially constrained firms. When net operating income is used as a profit proxy, this study also finds a similar pattern emerged. These findings confirm the earlier results that more financially constrained companies have lower optimal level of trade credit than less financially constrained ones. In general, all results are consistent with those displayed in Tables 4 and 5 but the estimated optimal TCR and TCP are lower when instrumental estimator are used.

[Insert Tables 8 and 9 here]

6. Conclusions

This paper provides empirical evidence of a non-linear association between trade credit and SMEs profitability with both aspects of trade credit considered, including trade credit

receivable (TCR) and trade credit payable (TCP). The study is based on a panel data set of 1,509 non –financial listed SMEs from nine countries or territories in East Asia and the Pacific, namely, China, Vietnam, Malaysia, Thailand, Japan, South Korea, Taiwan, Singapore and Hong Kong, over the seven-year period from 2010 to 2016. The findings indicate an inverted U-shaped relationship between TCR, TCP and firm profitability; that is, SMEs have an optimal trade credit level that balances between benefits and costs to maximize their profitability. Further investigations demonstrate that the profitability of firms will decrease when their trade credit level moves away from the optimal trade credit. . Moreover, firms display fast adjustment towards the optimum. Thus, this study suggests that trade credit is a crucial factor which influences SMEs' profitability, and managers of SMEs should try to keep the level of trade credit investment as close to the optimal point as possible.

Given that accessing formal finance is the greatest challenge facing SMEs in the East Asia and Pacific region, this paper analyses whether the optimal level of investment in TCR and TCP changes according to their financial constraints. By taking cash flow and external financing cost as proxies of financial constraints to classify firms, the paper shows that a concave relationship between trade credit and profitability exists in both more and less financially constrained firms. However, more financially constrained firms have lower optimal trade credit level than less financially constrained ones.

Although this study shows an inverted U-shaped association between trade credit and firm profitability, it has some limitations that may warrant investigations in the future. First, this study focuses only on listed SMEs in East Asia and the Pacific, and so the findings cannot be blindly applied to all SMEs in this region, especially unlisted SMEs. In fact, for non-listed SMEs, access to the financial markets is even harder than for listed ones; hence, managing their trade credit may be even more important. Second, this research only uses a sample of listed SMEs for a seven-year period from 2010 to 2016 – a calmer period after the financial crisis. However, problems of liquidity and financial constraints will increase in times of general financial crisis, and hence, provision and receipt of trade credit by SMEs will be different from the periods before and after the crisis. It would be interesting in the future to conduct similar research to compare outcomes among different periods.

Appendix A. Definition of SMEs in the Sampled Countries

Country	Industry	Criteria and the country's official definition					
		Employees	Operating income	Total capital	Sales turnover	Fixed assets	Stated capital
China	Agriculture, Forestry, Animal husbandry, and Fisher	≤ 1000	≤ 20 million yuan				
	Manufacturing	≤ 1000	≤ 400 million yuan				
	Construction	≤ 1000	≤ 800 million yuan				
	Transportation and postal industry	≤ 1000	≤ 300 million yuan				
	Wholesale Businesses	≤ 200	≤ 400 million yuan				
	Warehousing	≤ 200	≤ 300 million yuan				
	Retail	≤ 300	≤ 200 million yuan				
	Hotel service and catering	≤ 300	≤ 100 million yuan				
Vietnam	Agriculture, forestry, fisheries, industry and construction	10 - 300		20 billion - 100 billion VND			
	Trade and services	10 - 100		10 billion - 50 billion VND			
Malaysia	Manufacturing	5 - 200			300.000 – 50 million RM		
	Non-manufacturing	5 - 75			300.000 – 20 million RM		
Thailand	Manufacturing and Service	≤ 200				≤ 200 million THB	
	Wholesale	≤ 50				≤ 100 million THB	
	Retail	≤ 30				≤ 60 million THB	
Japan	Manufacturing, construction, transportation, and other industries	≤ 300					≤ 300 million Yen
	Wholesale trade	≤ 100					≤ 100 million Yen
	Service and retail trade	≤ 100					≤ 50 million Yen

Country	Industry	Criteria and the country's official definition					
		Employees	Operating income	Total capital	Sales turnover	Fixed assets	Stated capital
South Korea	Manufacturing industries (6)				≤ 150 billion KRW		
	Manufacturing industries (12), agriculture/ forestry/ fishery, electricity, gas, water business, wholesale/ retail business, mining industry, and construction industry				≤ 100 billion KRW		
	Other manufacturing industries (6), transportation business, sewage disposal/ environment remediation business, publication/ information service business				≤ 80 billion KRW		
	Repair / other personal service business; Business-supporting service business; Science/technology service business; Health / social welfare business; Art/sports service business				≤ 60 billion KRW		
	Lodging/restaurant business; Educational service business				≤ 40 billion KRW		
Taiwan	Manufacturing, construction, mining and quarrying industries	≤ 200					≤ 80 million TWD
	Commerce, transportation services, and other services	≤ 100					≤ 100 million TWD

Country	Industry	Criteria and country's official definition					
		Employees	Operating income	Total capital	Sales turnover	Fixed assets	Stated capital
Singapore	Manufacturing and Non-Manufacturing	≤ 200			≤ 100 million SGD		
Hong Kong	Manufacturing	≤ 100					
	Non – Manufacturing	≤ 50					

Sources: The National Bureau of Statistics of China (OECD, 2016), Vietnamese Ministry of Planning and Investment (2009), National SME Development Council (NSDC), Office of Small and Medium Enterprises Promotion (2004), Small and Medium Enterprise Agency (2016), Ministry of SMEs and Startups (2015), Small and Medium Enterprise Administration (2017), Spring Singapore (2014), and Trade and Industry Department (2012).

Appendix B. Definition of dependent and independent variables in this study

Variables	Acronym	Measurement
Gross operating income	PRO_1	(Sales– costs of sales) ÷ total assets
Net operating income	PRO_2	(Sales – costs of sales – depreciation and Amortization) ÷ total assets
Trade credit receivable	TCR	The ratio of accounts receivable to total sales
Trade credit payable	TCP	The ratio of accounts payable to total assets
Financial leverage	LEV	The ratio of total debt to total assets
Cash ratio	CASH	The ratio of cash and cash equivalents to total assets
Liquidity ratio	LIQ	The ratio of current assets to current liabilities
Assets tangibility	ATAN	The ratio of fixed assets to total assets
Sales growth	GROWTH	$(Sales_t – Sales_{t-1}) ÷ Sales_{t-1}$
Firm size	SIZE	The natural logarithm of total assets
Industry deviation	INDUST	The absolute value of the difference between the firm cash holding and the industry mean.
Annual GDP growth	GDP	$(GDP_t – GDP_{t-1}) ÷ GDP_{t-1}$

References

Abuhommous, A. A. A. (2017), "The Impact of Offering Trade Credit on Firms' Profitability", *Journal of Corporate Accounting and Finance*, Vol. 28 No. 6, pp. 29-40.

Acharya, V. V., Almeida, H. and Campello, M. (2007), "Is cash negative debt? A hedging perspective on corporate financial policies", *Journal of Financial Intermediation*, Vol. 16 No. 4, pp. 515-554.

Afrifa, G. A. (2016), "Net working capital, cash flow and performance of UK SMEs", *Review of Accounting and Finance*, Vol.15 No.1, pp. 21-44.

Afrifa, G. A. and Padachi, K. (2016), "Working capital level influence on SME profitability", *Journal of Small Business and Enterprise Development*, Vol. 23 No.1, pp. 44-63.

Asian Development Bank (2014), *ADB-OECD Study on Enhancing Financial Accessibility for SMEs: Lessons from Recent Crises*, Philippines.

Asian Development Bank (2015), *Asia Small and Medium-sized Enterprise (SME) Finance Monitor 2014*, Philippines.

Baños-Caballero, S., García-Teruel, P. J. and Martínez-Solano, P. (2012), "How does working capital management affect the profitability of Spanish SMEs?", *Small Business Economics*, Vol. 39 No. 2, pp. 517-529.

Baños-Caballero, S., García-Teruel, P. J. and Martínez-Solano, P. (2013), "The speed of adjustment in working capital requirement", *European Journal of Finance*, Vol. 19 No. 10, pp. 978-992.

Baños-Caballero, S., García-Teruel, P. J. and Martínez-Solano, P. (2014), "Working capital management, corporate performance, and financial constraints", *Journal of Business Research*, Vol. 67 No. 3, pp. 332-338.

Berger, A. N., Klapper, L. F. and Udell, G. F. (2001), "The ability of banks to lend to informationally opaque small businesses", *Journal of Banking and Finance*, Vol. 25 No. 12, pp. 2127-2167.

Berger, A. N. and Udell, G. F. (1998), "The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle", *Journal of banking and finance*, Vol. 22 No. 6, pp. 613-673.

Berger, P. G. and Ofek, E. (1995), "Diversification's effect on firm value", *Journal of financial economics*, Vol. 37 No. 1, pp. 39-65.

Brennan, M. J., Maksimovics, V. and Zechner, J. (1988), "Vendor financing", *The Journal of Finance*, Vol. 43 No. 5, pp. 1127-1141.

Brooks, C. (2008), *Introductory Econometrics for Finance*, New York: Cambidge University Press.

Brush, T. H., Bromiley, P. and Hendrickx, M. (2000), "The free cash flow hypothesis for sales growth and firm performance", *Strategic Management Journal*, Vol. 21 No. 4, pp. 455-472.

Carbo-Valverde, S., Rodriguez-Fernandez, F. and Udell, G. F. (2016), "Trade Credit, the Financial Crisis, and SME Access to Finance", *Journal of Money Credit and Banking*, Vol. 48 No. 1, pp. 113-143.

Chen, Y. R. (2008), "Corporate governance and cash holdings: Listed new economy versus old economy firms", *Corporate Governance: An International Review*, Vol. 16 No. 5, pp. 430-442.

Cheng, N. S. and Pike, R. (2003), "The trade credit decision: evidence of UK firms", *Managerial and Decision Economics*, Vol. 24 No. 6-7, pp. 419-438.

Cunat, V. (2006), "Trade credit: suppliers as debt collectors and insurance providers", *The Review of Financial Studies*, Vol. 20 No. 2, pp. 491-527.

Deloof, M. (2003), "Does working capital management affect profitability of Belgian firms?", *Journal of business finance and accounting*, Vol. 30 No. 3-4, pp. 573-588.

Deloof, M. and Jegers, M. (1996), "Trade credit, product quality, and intragroup trade: Some European evidence", *Financial Management*, Vol. 25 No. 3, pp. 33-43.

Demirgüç-Kunt, A. and Maksimovic, V. (1999), "Institutions, financial markets, and firm debt maturity", *Journal of financial economics*, Vol. 54 No. 3, pp. 295-336.

Emery, G. W. (1984), "A pure financial explanation for trade credit ", *Journal of Financial and Quantitative Analysis*, Vol. 19 No. 3, pp. 271-285.

Ferrando, A. and Mulier, K. (2013), "Do firms use the trade credit channel to manage growth?", *Journal of Banking and Finance*, Vol. 37 No. 8, pp. 3035-3046.

Ferris, J. S. (1981), "A transactions theory of trade credit use", *The Quarterly Journal of Economics*, Vol. 96 No. 2, pp. 243-270.

Field, A. (2009), *Discovering statistics using SPSS*, Sage Publications, London.

Fisman, R. and Love, I. (2003), "Trade credit, financial intermediary development, and industry growth", *The Journal of finance*, Vol. 58 No. 1, pp. 353-374.

García-Teruel, P. J. and Martínez-Solano, P. (2007), "Effects of working capital management on SME profitability", *International Journal of managerial finance*, Vol. 3 No. 2, pp. 164-177.

García-Teruel, P. J. and Martínez-Solano, P. (2010a), "A dynamic approach to accounts receivable: a study of Spanish SMEs", *European Financial Management*, Vol. 16 No. 3, pp. 400-421.

García-Teruel, P. J. and Martínez-Solano, P. (2010b), "A dynamic perspective on the determinants of accounts payable", *Review of Quantitative Finance and Accounting*, Vol. 34 No. 4, pp. 439-457.

Hausman, J. A. (1978), "Specification tests in econometrics", *Econometrica: Journal of the Econometric Society*, Vol. 46 No. 6, pp. 1251-1271.

Hill, M. D., Kelly, G. W. and Lockhart, G. B. (2012), "Shareholder Returns from Supplying Trade Credit", *Financial Management*, Vol. 41 No. 1, pp. 255-280.

Himmelberg, C. P., Hubbard, R. G. and Palia, D. (1999), "Understanding the determinants of managerial ownership and the link between ownership and performance", *Journal of financial economics*, Vol. 53 No. 3, pp. 353-384.

Hsiao, C. (1985), "Benefits and limitations of panel data", *Econometric Reviews*, Vol. 4 No. 1, pp. 121-174.

Huyghebaert, N. (2006), "On the determinants and dynamics of trade credit use: Empirical evidence from business start-ups", *Journal of Business Finance and Accounting*, Vol. 33 No. 1-2, pp. 305-328.

Kestens, K., Van Cauwenberge, P. and Vander Bauwhede, H. (2012), "Trade credit and company performance during the 2008 financial crisis", *Accounting and Finance*, Vol. 52 No. 4, pp. 1125-1151.

Kim, Y. H. and Atkins, J. C. (1978), "Evaluating investments in accounts receivable: a wealth maximizing framework", *The Journal of Finance*, Vol. 33 No. 2, pp. 403-412.

Kim, Y. H. and Chung, K. H. (1990), "An integrated evaluation of investment in inventory and credit: a cash flow approach", *Journal of Business Finance & Accounting*, Vol. 17 No. 3, pp. 381-389.

Lewellen, W. G., McConnell, J. J. and Scott, J. A. (1980), "Capital market influences on trade credit policies", *Journal of Financial Research*, Vol. 3 No. 2, pp. 105-113.

Lin, T. T. and Chou, J. H. (2015), "Trade credit and bank loan: Evidence from Chinese firms", *International Review of Economics and Finance*, Vol. 36 No., pp. 17-29.

Long, M. S., Malitz, I. B. and Ravid, S. A. (1993), "Trade credit, quality guarantees, and product marketability", *Financial management*, Vol. 22 No. 4, pp. 117-127.

Love, I., Preve, L. A. and Sarria-Allende, V. (2007), "Trade credit and bank credit: Evidence from recent financial crises", *Journal of Financial Economics*, Vol. 83 No. 2, pp. 453-469.

Lyngstadaas, H. and Berg, T. (2016), "Working capital management: evidence from Norway", *International Journal of Managerial Finance*, Vol. 12 No. 3, pp. 295-313.

Martínez-Sola, C., García-Teruel, P. J. and Martínez-Solano, P. (2013a), "Corporate cash holding and firm value", *Applied Economics*, Vol. 45 No. 2, pp. 161-170.

Martínez-Sola, C., García-Teruel, P. J. and Martínez-Solano, P. (2013b), "Trade credit policy and firm value", *Accounting and Finance*, Vol. 53 No. 3, pp. 791-808.

Martínez-Sola, C., García-Teruel, P. J. and Martínez-Solano, P. (2014), "Trade credit and SME profitability", *Small Business Economics*, Vol. 42 No. 3, pp. 561-577.

Martínez-Sola, C., García-Teruel, P. J. and Martínez-Solano, P. (2018), "Cash holdings in SMEs: speed of adjustment, growth and financing", *Small Business Economics*, pp. 1-20.

Meltzer, A. H. (1960), "Mercantile credit, monetary policy, and size of firms", *The Review of Economics and Statistics*, Vol. 42 No. 4, pp. 429-437.

Mian, S. L. and Smith, C. W. (1992), "Accounts receivable management policy: theory and evidence", *The Journal of Finance*, Vol. 47 No. 1, pp. 169-200.

Ministry of Planning and Investment (2009), "*On assistance to the develoment of Small- and Medium-sized enterprises",* available at: http://moj.gov.vn/vbpq/en/lists/vn%20bn%20php%20lut/view_detail.aspx?itemid=10681 (accessed 1 May 2018).

Ministry of SMEs and Startups (2015), "*Article 2 of Framework Act on SMEs and Article 3 of Enforcement Decree of the Act", a*vailable at: http://www.smba.go.kr/site/eng/02/10201000000002016111504.jsp (accessed 4 May 2018).

Modigliani, F. and Miller, M. H. (1963), "Corporate income taxes and the cost of capital: a correction", *The American economic review*, Vol. 53 No. 3, pp. 433-443.

Molina, C. A. and Preve, L. A. (2009), "Trade receivables policy of distressed firms and its effect on the costs of financial distress", *Financial Management*, Vol. 38 No. 3, pp. 663-686.

Mun, S. G. and Jang, S. S. (2015), "Working capital, cash holding, and profitability of restaurant firms", *International Journal of Hospitality Management*, Vol. 48 No., pp. 1-11.

Nadiri, M. I. (1969), "The determinants of trade credit in the US total manufacturing sector", *Econometrica: Journal of the Econometric Society*, Vol. 37 No. 3, pp. 408-423.

National Statistics (2018), "*Naitonal Accounts",* available at: https://eng.stat.gov.tw/point.asp?index=1 (accessed 5 May 2018).

Neale, C. W. and Shipley, D. D. (1985), "An international comparative study of credit strategy", *European Journal of Marketing*, Vol. 19 No. 6, pp. 24-38.

Ng, C. K., Smith, J. K. and Smith, R. L. (1999), "Evidence on the determinants of credit terms used in interfirm trade", *The Journal of Finance*, Vol. 54 No. 3, pp. 1109-1129.

Niskanen, J. and Niskanen, M. (2006), "The determinants of corporate trade credit policies in a bank-dominated financial environment: the case of Finnish small firms", *European Financial Management*, Vol. 12 No. 1, pp. 81-102.

OECD (2016), *Financing SMEs and Entrepreneurs 2016: An OECD Scoreboard,*Paris.

Office of Small and Medium Enterprises Promotion (2004), "*The White Paper on Small and Medium Enterprises of Thailand in 2003 and Trends 2004",* available at: http://www.sme.go.th/upload/mod_download/white_paper_2003_Eng-20171024122619-20171031123745.pdf (accessed 6 May 2018).

Pais, M. A. and Gama, P. M. (2015), "Working capital management and SMEs profitability: Portuguese evidence", *International Journal of Managerial Finance*, Vol. 11 No. 3, pp. 341-358.

Petersen, M. A. and Rajan, R. G. (1997), "Trade credit: theories and evidence", *Review of financial studies*, Vol. 10 No. 3, pp. 661-691.

Preve, L. and Sarria-Allende, V. (2010), *Working capital management*, Oxford University Press.

Psillaki, M. and Eleftheriou, K. (2015), "Trade credit, bank credit, and flight to quality: Evidence from French SMEs", *Journal of Small Business Management*, Vol. 53 No. 4, pp. 1219-1240.

Rajan, R. G. and Zingales, L. (1995), "What do we know about capital structure? Some evidence from international data", *The journal of Finance*, Vol. 50 No. 5, pp. 1421-1460.

Schwartz, R. A. (1974), "An economic model of trade credit", *Journal of financial and quantitative analysis*, Vol. 9 No. 4, pp. 643-657.

Small and Medium Enterprise Administration (2017), "*The definition of SMEs",* available at: https://www.moeasmea.gov.tw/ct.asp?xItem=70&CtNode=261&mp=2 (accessed 7 May 2018).

Small and Medium Enterprise Agency (2016), "*Small and Medium-sized Enterprise Basic Act",* available at: http://www.chusho.meti.go.jp/sme_english/outline/08/01_01.html (accessed 8 May 2018).

Smith, J. K. (1987), "Trade credit and informational asymmetry", *The Journal of Finance*, Vol. 42 No. 4, pp. 863-872.

Spring Singapore (2014), "*New SME definition and Incentives Criteria",* available at: http://www.bcm.org.sg/Portals/0/Resources/New%20SME%20Definition.pdf (accessed 9 May 2018).

Stein, P., Ardic, O. P. and Hommes, M. (2013), *Closing the credit gap for formal and informal micro, small, and medium enterprises*. Washington, DC.

The World Bank (2018), "*Regions and countries",* available at: https://datacatalog.worldbank.org/#region_country_container (accessed 10 May 2018).

Titman, S. and Wessels, R. (1988), "The determinants of capital structure choice", *The Journal of finance*, Vol. 43 No. 1, pp. 1-19.

Trade and Industry Department (2012), "*A report on support measures for Small and Medium Enterprises",* available at: https://www.tid.gov.hk/english/aboutus/publications/smes/smes04_chapter2.html#(Note%20 1) (accessed 10 May 2018).

Van Horne, J. C. and Wachowicz, J. M. (2008), *Fundamentals of financial management*, Pearson Education, UK.

Watson, D. and Head, A. (2010), *Corporate finance: principles and practice*, Pearson Education Ltd, UK.

Wilner, B. S. (2000), "The exploitation of relationships in financial distress: The case of trade credit", *The Journal of Finance*, Vol. 55 No. 1, pp. 153-178.

Yang, C.-H. and Chen, K.-H. (2009), "Are small firms less efficient?", *Small Business Economics*, Vol. 32 No. 4, pp. 375-395.

Figure 1. Evolution of trade credit in SMEs from 2010 to 2016. The ratios are calculated using data extracted from Bloomberg

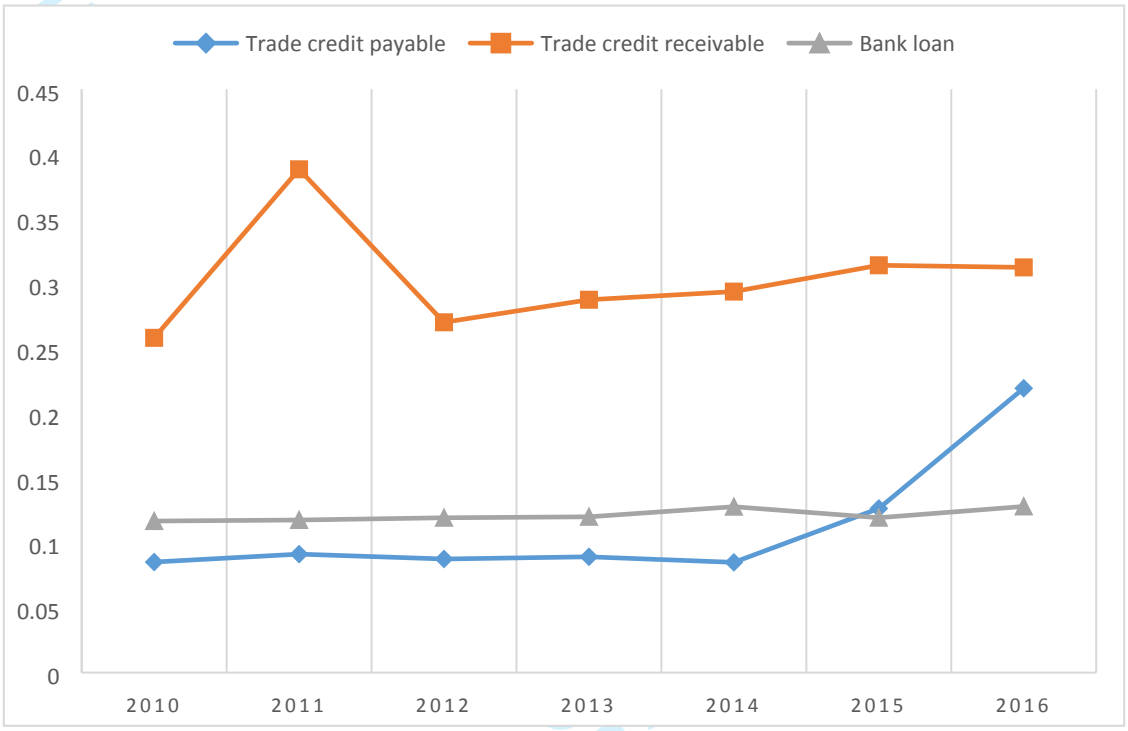

Table 1. The number of SMEs selected for this study

Country	SMEs market	Listed of companies
China	ChiNext	276
Vietnam	HNX	130
Malaysia	ACE market	71
Thailand	MAI	68
Japan	JASDAQ	220
	MOTHER	26
South Korea	KOSDAQ	353
Taiwan	GreTai	164
Singapore	SGX Catalist	125
Hong Kong	GEM	76
Total		**1,509**

Table 2. Summary statistics

Variable	Observation	Mean	Median	Std. Dev	Min	Max
PRO_1	10,537	0.2073	0.1709	0.1550	0.0119	0.5840
PRO_2	10,537	0.1797	0.1442	0.1530	-0.0207	0.5502
TCR	10,537	0.2487	0.2014	0.1959	0.0077	0.7671
TCP	10,537	0.0805	0.0566	0.0766	0.0000	0.2688
LEV	10,537	0.3532	0.3320	0.2063	0.0488	0.7508
CASH	10,537	0.2028	0.1467	0.1780	0.0063	0.6230
LIQ	10,537	3.3811	2.2014	3.1127	0.4643	12.463
ATAN	10,537	0.2064	0.1510	0.1901	0.0000	0.6384
GROWTH	10,537	0.1077	0.0513	0.3206	-0.4318	0.9176
SIZE	10,537	3.1281	3.3372	1.3416	0.1463	5.1720
INDUST	10,537	0.0753	0.0508	0.0698	0.0046	0.2582
GDP	10,537	0.0445	0.0368	0.0273	0.0081	0.1063

Notes: All independent and dependent variables are defined in Appendix B.

Table 3. Correlation matrix

	PRO_1	PRO_2	TCR	TCP	LEV	CASH	LIQ	ATAN	GROWTH	SIZE	INDUST	GDP
PRO_1	1.00											
PRO_2	0.98***	1.00										
TCR	-0.20***	-0.19***	1.00									
TCP	0.16***	0.17***	0.11***	1.00								
LEV	0.06***	0.04***	-0.03**	0.43***	1.00							
CASH	0.21***	0.24***	0.02	-0.10***	-0.34***	1.00						
LIQ	-0.03**	-0.005	0.09***	-0.34***	-0.66***	0.52***	1.00					
ATAN	0.08***	0.05***	-0.07***	0.05***	0.09***	-0.16***	-0.12***	1.00				
GROWTH	0.09***	0.11***	0.07***	0.05***	0.04***	0.02**	-0.01	-0.0006	1.00			
SIZE	-0.19***	-0.16***	0.27***	-0.02*	0.03***	0.08***	0.09***	0.0045	0.16***	1.00		
INDUST	0.24***	0.19***	-0.12***	-0.03***	0.003	0.11***	0.03***	-0.03***	-0.01	-0.32***	1.00	
GDP	-0.08***	-0.06***	0.23***	-0.01	-0.17***	0.08***	0.08***	0.04***	0.21***	0.01	-0.04***	1.00

Notes: All independent and dependent variables are defined in Appendix B. The symbols *, **, and *** indicate significance at 10%, 5%, and 1% levels respectively.

Table 4. The non-linear relationship between trade credit and firm profitability (using Fixed Effect Model)

Variables	PRO_1		PRO_2	
	(1)	(2)	(3)	(4)
TCR	0.187***		0.167***	
	(5.57)		(5.04)	
TCR^2	-0.292***		-0.268***	
	(-7.45)		(-6.94)	
TCP		0.919***		0.853***
		(10.41)		(9.58)
TCP^2		-2.361***		-2.115***
		(-7.44)		(-6.63)
LEV	0.084***	0.058***	0.076***	0.050***
	(5.57)	(3.78)	(5.13)	(3.27)
CASH	0.098***	0.101***	0.101***	0.104***
	(6.86)	(7.21)	(7.18)	(7.57)
LIQ	-0.000021	0.002**	-0.000027	0.001*
	(-0.03)	(1.98)	(-0.04)	(1.83)
ATAN	0.102***	0.100***	0.074***	0.072***
	(7.04)	(7.21)	(5.05)	(5.17)
GROWTH	0.061***	0.060***	0.062***	0.061***
	(18.18)	(18.57)	(18.58)	(18.87)
SIZE	0.001	-0.001	-0.001	-0.004
	(0.40)	(-0.37)	(-0.42)	(-1.26)
INDUST	0.357***	0.346***	0.297***	0.286***
	(11.33)	(11.10)	(9.45)	(9.22)
GDP	0.326***	0.268***	0.301***	0.245***
	(3.70)	(3.09)	(3.36)	(2.76)
Constant	0.060***	0.050***	0.060***	0.049***
	(5.39)	(4.42)	(5.32)	(4.36)
Hausman	0.000	0.000	0.000	0.000
Modified Wald	0.000	0.000	0.000	0.000
Wooldridge	0.000	0.000	0.000	0.000
R-squared	0.221	0.238	0.192	0.208
Observations	10,537	10,537	10,537	10,537

Notes: In Columns (1) and (2), the dependent variable is gross operating income (PRO_1). In Columns (3) and (4), the dependent variable is net operating income (PRO_2). All models are estimated with robust standard errors. Time dummies are included in all regressions. Hausman is the p-value of the Hausman (1978) test used to choose between Fixed Effect Model (FEM) and Random Effect Model (REM). Modified Wald is the p-value of the Modified Wald test for heteroscedasticity. Wooldridge is the p-value of the Wooldridge test for autocorrelation. All independent and dependent variables are defined in Appendix B. t-statistics are in parentheses. The symbols *, **, and *** indicate significance at 10%, 5%, and 1% levels respectively.

Table 5. The influence of financial constraints on the relationship between trade credit receivable and firm profitability (using Fixed Effect Model)

Variables	PRO_1				PRO_2			
	Cash flow		External financing cost		Cash flow		External financing cost	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TCR	0.307***		0.275***		0.282***		0.268***	
	(9.007)		(7.72)		(8.40)		(7.66)	
TCR * FC	-0.246***		-0.169***		-0.240***		-0.200***	
	(-20.96)		(-6.30)		(-20.73)		(-7.51)	
TCR^2	-0.328***		-0.391***		-0.301***		-0.388***	
	(-8.00)		(-9.00)		(-7.45)		(-9.02)	
TCR^2 * FC	0.143***		0.225***		0.139***		0.277***	
	(13.19)		(4.27)		(13.35)		(5.31)	
TCP		0.788***		1.163***		0.776***		1.276***
		(15.20)		(12.14)		(14.90)		(11.18)
TCP * FC		-0.657***		-0.359***		-0.642***		-0.530***
		(-16.75)		(-4.38)		(-16.37)		(-5.31)
TCP^2		-0.888***		-2.974***		-0.838***		-3.292***
		(-6.36)		(-8.06)		(-6.06)		(-7.37)
TCP^2 * FC		0.604***		0.846**		0.580***		1.304***
		(4.18)		(2.01)		(4.03)		(2.95)
LEV	0.090***	0.071***	0.091***	0.066***	0.083***	0.061***	0.084***	0.073***
	(6.15)	(4.79)	(6.03)	(4.28)	(5.70)	(4.26)	(5.68)	(3.61)
CASH	0.091***	0.093***	0.094***	0.095***	0.095***	0.096***	0.097***	0.109***
	(6.58)	(6.77)	(6.63)	(6.86)	(6.93)	(7.13)	(6.93)	(6.70)
LIQ	0.0002	0.0014*	-0.0002	0.002**	0.0002	0.0013*	-0.00018	0.0019**
	(0.29)	(1.77)	(-0.20)	(2.21)	(0.28)	(1.70)	(-0.23)	(2.12)
ATAN	0.103***	0.107***	0.102***	0.101***	0.074***	0.078***	0.074***	0.080***
	(7.22)	(7.82)	(7.00)	(7.23)	(5.16)	(5.65)	(5.02)	(4.58)
GROWTH	0.050***	0.049***	0.059***	0.059***	0.051***	0.050***	0.059***	0.068***

	(15.96)	(15.61)	(17.80)	(18.31)	(16.44)	(16.00)	(18.17)	(17.57)
SIZE	0.001	0.001	0.0024	-0.001	-0.0014	-0.0018	-0.0001	-0.0082**
	(0.38)	(0.39)	(0.74)	(-0.31)	(-0.47)	(-0.63)	(-0.03)	(-2.07)
INDUST	0.346***	0.334***	0.354***	0.342***	0.286***	0.274***	0.293***	0.278***
	(11.46)	(11.19)	(11.28)	(11.04)	(9.49)	(9.22)	(9.39)	(7.48)
GDP	0.282***	0.233***	0.308***	0.244***	0.258***	0.209**	0.281***	0.231**
	(3.30)	(2.72)	(3.52)	(2.82)	(2.95)	(2.39)	(3.15)	(2.13)
Constant	0.059***	0.055***	0.060***	0.049***	0.058***	0.059***	0.059***	0.052***
	(5.42)	(4.97)	(5.38)	(4.40)	(5.40)	(5.32)	(5.36)	(3.95)
F_1	0.06	0.01	0.00	0.00	0.00	0.01	0.06	0.00
F_2	0.00	0.03	0.00	0.00	0.00	0.04	0.03	0.00
R-squared	0.278	0.290	0.230	0.246	0.249	0.261	0.203	0.189
Observations	10,537	10,537	10,537	10,537	10,537	10,537	10,537	10,537

Notes: In Columns (1), (2), (3), and (4), the dependent variable is gross operating income (PRO_1). In Columns (5), (6), (7) and (8), the dependent variable is net operating income (PRO_2). FC is a dummy variable representing financial constraints and it takes the value one for firms more likely to be financially constrained and zero otherwise. In Columns (1), (2), (5), and (6), we estimate models (5) and (6) by using the cash flow to classify firms that are suffering from financial constraints and those that are not. In Columns (3), (4), (7), and (8), we estimate models (5) and (6) by using the external financing cost to classify firms that are suffering from financial constraints and those that are not. All models are estimated with robust standard errors. Time dummies are included in all regressions. All independent and dependent variables are defined in Appendix B. F_1 is the p-value of a F-test for the linear restriction test under the following null hypothesis: H_0: $(\beta_1 + \alpha_1) = 0$. F_2 is the p-value of a F-test for the linear restriction test under the following null hypothesis: H_0: $(\beta_2 + \alpha_2) = 0$. t-statistics are in parentheses**.** The symbols *, **, and *** indicate significance at 10%, 5%, and 1% levels respectively.

Table 6. The relationship between deviations from optimal trade credit level and firm profitability (using Fixed Effect Model)

Variables	PRO_1				PRO_2			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEVIATION_TCR	-0.059***	-0.07*			-0.061***	-0.066*		
	(-4.33)	(-1.70)			(-4.61)	(-1.66)		
INTERACT_TCR		-0.011				-0.01		
		(-0.23)				(-0.21)		
DEVIATION_TCP			-0.253***	-0.707***			-0.233***	-0.656***
			(-4.71)	(-6.70)			(-4.30)	(-6.10)
INTERACT_TCP				0.601***				0.559***
				(5.66)				(5.16)
LEV	0.095***	0.123***	0.132***	0.125***	0.086***	0.103***	0.118***	0.111***
	(6.39)	(6.26)	(6.54)	(6.31)	(5.89)	(5.31)	(5.82)	(5.58)
CASH	0.102***	0.106***	0.127***	0.133***	0.105***	0.116***	0.132***	0.138***
	(7.08)	(6.45)	(7.53)	(7.88)	(7.37)	(6.95)	(7.85)	(8.18)
LIQ	0.0003	0.0004	-0.0002	-0.0008	0.0002	0.0004	-0.0002	-0.0008
	(0.35)	(0.41)	(-0.18)	(-0.95)	(0.31)	(0.47)	(-0.20)	(-0.91)
ATAN	0.106***	0.070***	0.118***	0.121***	0.077***	0.085***	0.089***	0.092***
	(7.29)	(6.04)	(6.65)	(6.82)	(5.27)	(4.69)	(4.95)	(5.09)
GROWTH	0.064***	0.070***	0.069***	0.0681***	0.065***	0.073***	0.073***	0.072***
	(19.31)	(17.95)	(18.06)	(17.87)	(19.67)	(18.50)	(18.62)	(18.45)
SIZE	0.0033	-0.0012	-0.0022	-0.0023	0.0003	-0.004	-0.005	-0.005
	(1.09)	(-0.30)	(-0.55)	(-0.58)	(0.09)	(-1.02)	(-1.29)	(-1.32)
INDUST	0.362***	0.232***	0.375***	0.362***	0.301***	0.299***	0.299***	0.287***
	(11.45)	(6.99)	(10.17)	(9.94)	(9.57)	(7.86)	(7.94)	(7.71)
GDP	0.332***	0.390***	0.378***	0.385***	0.307***	0.329***	0.329***	0.335***
	(3.74)	(3.83)	(3.492)	(3.55)	(3.40)	(2.99)	(3.00)	(3.04)
Constant	0.064***	0.083***	0.063***	0.052***	0.063***	0.069***	0.064***	0.054***

	(5.67)	(6.18)	(4.720)	(3.81)	(5.57)	(5.02)	(4.77)	(3.93)
F-test		0.000		0.050		0.000		0.078
R-squared	0.213	0.175	0.189	0.195	0.186	0.160	0.160	0.165
Observations	10,537	10,537	10,537	10,537	10,537	10,537	10,537	10,537

Notes: In Columns (1), (2), (3) and (4), the dependent variable is gross operating income (PRO_1). In Columns (5), (6), (7) and (8), the dependent variable is net operating income (PRO_2). DEVIATION_TCR and DEVIATION_TCP are the residuals from optimal level of trade credit receivable and trade credit payable, respectively. INTERACT_TCR is DEVIATION_TCR * above-optimal. INTERACT_TCP is DEIVATION_TCP * above-optimal. The above-optimal is a dummy variable that takes 0 for negative residuals and 1 otherwise. All control variables are defined in Appendix B. All models are estimated with robust standard errors. Time dummies are included in all regressions. F-test is the p-value of a F-test for the null hypothesis that the sum of the coefficients of deviation and interact is zero. t-statistics are in parentheses. The symbols *, **, and *** indicate significance at 10%, 5%, and 1% levels respectively.

Table 7. The speed of adjustment of SMEs to the optimal trade credit level (using Fixed Effect Model)

Variables	TCR (1)	TCP (2)
TCR_{t-1}	0.189***	
	(9.02)	
TCP_{t-1}		0.159***
		(9.34)
SIZE	0.040***	0.007***
	(7.40)	(3.79)
GROWTH	-0.044***	0.004**
	(-7.02)	(2.48)
STDEBT	0.004	-0.037***
	(0.42)	(-8.77)
LTDEBT	___	-0.031***
		(-6.87)
TURN	-0.004	0.037***
	(-0.63)	(15.38)
CFLOW	-0.030**	-0.018***
	(-2.01)	(-5.92)
CASH	___	-0.040***
		(-7.27)
GROF	0.092***	___
	(2.98)	
Constant	0.064***	0.031***
	(3.03)	(4.50)
R-squared	0.088	0.219
Observations	9,025	9,025

Notes: In Column (1), the dependent variable is trade credit receivable (TCR). In Column (2), the dependent variable is trade credit payable (TCP). Firm size (SIZE) is the natural logarithm of total assets. Sales growth (GROWTH) is measured as ($Sales_t$ – $Sales_{t-1}$) ÷ $Sales_{t-1}$. Short-term finance (STDEBT) is calculated as short-term financial debt ÷ total assets. Long-term finance (LTDEBT) is calculated as long-term debt ÷ total assets. Product quality (TURN) is measured as total sales ÷ (total assets - accounts receivable). Cash flow (CFLOW) is calculated as (net income + depreciation) ÷ total sales. Cash ratio (CASH) is calculated as (cash + cash equivalents) ÷ total assets. Profit margin (GROF) is calculated as gross profit ÷ sales. All models are estimated with robust standard errors. Time dummies are included in all regressions. t-statistics are in parentheses. The symbols *, **, and *** indicate significance at 10%, 5%, and 1% levels respectively.

Table 8. The non-linearity relationship between trade credit and firm profitability (using instrumental variables)

Variables	PRO_1		PRO_2	
	(1)	(2)	(3)	(4)
TCR	0.131***		0.117**	
	(2.61)		(2.37)	
TCR^2	-0.406***		-0.375***	
	(-6.12)		(-5.81)	
TCP		1.658**		1.647**
		(2.25)		(2.38)
TCP^2		-5.466*		-5.240*
		(-1.86)		(-1.90)
LEV	-0.029***	-0.043**	-0.025**	-0.045***
	(-2.59)	(-2.43)	(-2.26)	(-2.65)
CASH	0.234***	0.227***	0.251***	0.242***
	(21.35)	(18.22)	(23.09)	(19.72)
LIQ	-0.008***	-0.004**	-0.007***	-0.003*
	(-11.02)	(-2.04)	(-10.16)	(-1.69)
ATAN	0.051***	0.067***	0.031***	0.046***
	(5.93)	(6.52)	(3.57)	(4.53)
GROWTH	0.059***	0.061***	0.061***	0.063***
	(11.56)	(12.19)	(12.22)	(12.73)
SIZE	-0.023***	-0.027***	-0.019***	-0.023***
	(-16.67)	(-16.38)	(-13.96)	(-14.08)
INDUST	0.202***	0.244***	0.101***	0.147***
	(7.00)	(7.87)	(3.49)	(4.76)
GDP	-0.406***	-1.166***	-0.440***	-1.169***
	(-5.66)	(-11.15)	(-6.06)	(-11.58)
Constant	0.245***	0.193***	0.212***	0.158***
	(23.04)	(6.93)	(20.42)	(5.98)
R-squared	0.184	0.171	0.160	0.150
Observations	9,025	9,025	9,025	9,025

Notes: In Columns (1) and (2), the dependent variable is gross operating income (PRO_1). In Columns (3) and (4), the dependent variable is net operating income (PRO_2). All models are estimated with robust standard errors. Time dummies are included in all regressions. All independent and dependent variables are defined in Appendix B. t-statistics are in parentheses**.** The symbols *, **, and *** indicate significance at 10%, 5%, and 1% levels respectively.

Table 9. The influence of financial constraints on the relationship between trade credit receivable and firm profitability (using instrumental variables)

Variables	PRO_1				PRO_2			
	Cash flow		External financing cost		Cash flow		External financing cost	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TCR	0.809***		0.745***		0.752***		0.768***	
	(9.25)		(7.90)		(8.47)		(8.26)	
TCR * FC	-0.577***		-0.310***		-0.536***		-0.333***	
	(-20.77)		(-12.31)		(-19.40)		(-13.32)	
TCR^2	-1.075***		-1.202***		-1.005***		-1.219***	
	(-8.32)		(-8.95)		(-7.64)		(-9.22)	
TCR^2 * FC	0.189***		0.226***		0.177***		0.242***	
	(6.45)		(7.67)		(6.06)		(8.30)	
TCP		1.931***		1.368***		1.811***		1.482***
		(10.63)		(6.62)		(9.94)		(7.21)
TCP * FC		-1.725***		-0.642***		-1.578***		-0.735***
		(-16.17)		(-7.29)		(-14.82)		(-8.37)
TCP^2		-5.779***		-4.281***		-5.190***		-4.541***
		(-7.14)		(-4.66)		(-6.41)		(-4.99)
TCP^2 * FC		2.780***		1.542***		2.560***		1.770***
		(7.33)		(4.53)		(6.84)		(5.27)
LEV	0.009	-0.027**	-0.003	-0.037***	0.0104	-0.032***	0.003	-0.036***
	(0.80)	(-2.32)	(-0.30)	(-3.07)	(0.95)	(-2.81)	(0.23)	(-2.99)
CASH	0.232***	0.222***	0.209***	0.216***	0.249***	0.238***	0.224***	0.228***
	(21.86)	(20.35)	(18.37)	(18.68)	(23.60)	(21.92)	(19.83)	(19.86)
LIQ	-0.006***	-0.005***	-0.008***	-0.006***	-0.006***	-0.004***	-0.008***	-0.005***
	(-8.83)	(-6.49)	(-11.16)	(-7.52)	(-8.04)	(-5.60)	(-10.28)	(-6.35)
ATAN	0.030***	0.054***	0.046***	0.072***	0.011	0.034***	0.025***	0.050***
	(3.54)	(6.42)	(5.20)	(8.50)	(1.32)	(4.06)	(2.85)	(5.90)

GROWTH	0.032***	0.033***	0.055***	0.058***	0.036***	0.038***	0.057***	0.059***
	(6.34)	(6.91)	(10.55)	(11.51)	(7.32)	(7.85)	(11.10)	(11.98)
SIZE	-0.025***	-0.025***	-0.024***	-0.026***	-0.021***	-0.021***	-0.020***	-0.022***
	(-17.40)	(-18.78)	(-16.89)	(-19.35)	(-14.58)	(-15.55)	(-14.28)	(-16.20)
INDUST	0.190***	0.198***	0.213***	0.226***	0.090***	0.104***	0.112***	0.129***
	(6.95)	(7.184)	(7.32)	(7.77)	(3.24)	(3.73)	(3.85)	(4.44)
GDP	-0.650***	-1.202***	-0.291***	-1.054***	-0.666***	-1.192***	-0.315***	-1.060***
	(-8.73)	(-19.28)	(-3.78)	(-16.52)	(-8.85)	(-18.88)	(-4.05)	(-16.40)
Constant	0.213***	0.229***	0.199***	0.219***	0.181***	0.193***	0.163***	0.181***
	(17.19)	(22.61)	(15.29)	(20.80)	(14.68)	(19.32)	(12.70)	(17.45)
F_1	0.00	0.09	0.00	0.00	0.00	0.09	0.00	0.00
F_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-squared	0.172	0.219	0.142	0.197	0.146	0.197	0.114	0.178
Observations	9,025	9,025	9,025	9,025	9,025	9,025	9,025	9,025

Notes: In Columns (1), (2), (3), and (4), the dependent variable is gross operating income (PRO_1). In Columns (5), (6), (7) and (8), the dependent variable is net operating income (PRO_2). FC is a dummy variable representing financial constraints and it takes the value one for firms more likely to be financially constrained and zero otherwise. In Columns (1), (2), (5), and (6), we estimate models (5) and (6) by using the cash flow to classify firms that are suffering from financial constraints and those that are not. In Columns (3), (4), (7), and (8), we estimate models (5) and (6) by using the external financing cost to classify firms that are suffering from financial constraints and those that are not. All models are estimated with robust standard errors. Time dummies are included in all regressions. All independent and dependent variables are defined in Appendix B. F_1 is the p-value of a F-test for the linear restriction test under the following null hypothesis: H_0: $(\beta_1 + \alpha_1) = 0$. F_2 is the p-value of a F-test for the linear restriction test under the following null hypothesis: H_0: $(\beta_2 + \alpha_2) = 0$. t-statistics are in parentheses**.** The symbols *, **, and *** indicate significance at 10%, 5%, and 1% levels respectively.