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Trade Credit in China: Exploring the Link between Short-Term Debt and Payables

Abstract: Trade credit constitutes an essential element of short-term financing for most firms, especially for small and medium-sized enterprises. This paper investigates the dynamics between short-term bank debt and payables among 1,525 Chinese small and medium-sized listed companies over the period of 2008–2016. The results suggest that an increase in stock and receivables is financed by both bank credit and payables. In addition, we find that bank credit and payables substitute each other. We also uncover a strong substitution effect among weak firms, possibly linked to the fact that weak firms struggle to access additional bank finance and thus are forced to rely on suppliers to support their growth. The substitution effect between payables and bank credit is robust to different cash conversion cycles and to the firm's liquidity.

Key words: trade credit, short-term debt, payables, SME

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1. Introduction

Firms' ability to cover their financing needs linked to daily operations (that is, to pay salaries, bills and suppliers regularly) plays a key role in their ability to survive and succeed. A lack of short-term finance can rapidly drive a firm out of business, since it implies firms' inability to retain a skilled workforce and access materials and services from suppliers. In fact, even if short-term financing needs (that is, working capital) can also be covered by issuing new equity, via retained profit or by raising long-term debt, the cost and, in the case of small and medium-sized enterprises (SMEs), the difficulties linked to accessing them makes such choices not feasible. Firms typically cover short-term financing needs by using cash available in the bank and by relying on two alternative forms of short-term finance: bank credit and trade credit. The former is provided by banks in the form of short-term loans, overdrafts, invoice discounting, contract discounting, etc. It is granted according to a creditworthiness evaluation that, in turn, is based on the historical financial information that firms provide to the lender. In fact, the literature stresses that SMEs are characterized by a high information asymmetry that compromises banks' capability to properly evaluate SMEs' creditworthiness (Bharath et al., 2007; Moro et al., 2015; Shin and Kolari, 2004). Trade credit is provided by suppliers through payment extensions (typically between 30 and 90 days). Interestingly, suppliers do not suffer from the information asymmetry banks face, since they make decisions according to whether the buyer pays regularly, information that is accessed by suppliers irrespective of buyers' ability to produce information or willingness to share it (Cuñat, 2006; Petersen and Rajan, 1997; Summers and Wilson, 2002). However, payables may be an expensive source of finance for firms (Cuñat, 2006; Petersen and Rajan, 1994): when customers can choose between paying the full amount in 30 days or enjoying a discount of 2% if they settle the invoice in full in 10 days, the use of 20 extra days of credit has an implied annualized interest rate of 36.5%. To sum up: firms that use payables may enjoy a

very flexible source of finance that is easier to access than bank finance. At the same time, payables may be more expensive than bank finance.

The decision to use payables and bank credit is not necessarily an easy one. In a context where buyers enjoy discounts if they pay immediately, firms can decide to use the two sources of credit as alternatives: They can decide to cover any additional financing needs by expanding bank credit as long as this source of finance is accessible, to keep financing costs low. They may switch to payables when they are not able to access additional bank finance. This approach implies a substitution effect between payables and bank credit (Huang et al., 2011; Psillaki and Eleftheriou, 2015), so that bank credit and credit from suppliers are inversely related. However, firms can also pursue a diversification strategy: they can decide to use both banks' and suppliers' credit in an attempt to maintain a mix of sources so that if one of them dries up (e.g., if the bank decides to reduce the credit previously given or a supplier that used to provide credit decides to cut it down), firms can rely on the other ones. If this is the case, additional financial needs are proportionally covered by both additional payables and bank debt, so that firms follow a complementarity logic in the use of payables and bank debt (Andrieu et al., 2018). In this scenario, the additional cost incurred by the firms can be seen as an insurance firms buy to be sure that they will not be financially constrained (Cuñat, 2006).

It is apparent that the link between suppliers' credit and bank credit (and cash holdings) is a very relevant topic from the academic, regulatory and practical points of view. However, the increasing literature has not provided a final explanation of the use of different sources of finance. Even more surprisingly, little attention has been paid so far to the rationale of the use of credit provided by suppliers in the Chinese context. Strangely, this is the case irrespective of the impact China has on the world economy and the important role played by SMEs in China as major drivers of its economic growth. Thus, we address the need

for exploration of the determinants of the use of bank credit vis-a-vis supplier credit in the case of Chinese SMEs.

Our research builds on the existing literature on the use of credit from suppliers (Deloof, 2003; Deloof and Jegers, 1996; Kling, 2018; Psillaki and Eleftheriou, 2015) by exploring the relationship between trade credit and bank credit. In particular, we examine whether SMEs tend to follow a complementarity or substitution logic in financing their working capital needs in the context of Chinese SMEs, a context where typically buyers are granted discounts when they pay immediately. We use a sample containing 1,525 small and medium-sized listed companies, obtained from the Wind dataset, for the period of 2008–2016. The time window we rely on allows us to explore the post-financial-crisis use of trade credit in a context that has been only marginally affected by the Great Recession.

Following Kling (2018), we explore firms' financing decisions by using a framework where the change in sales determines additional working capital needs (change in stock and change in receivables) that in turn affect the additional use of bank debt and payables. To explore the substitution/complementarity between bank and supplier credit, we focus on the link between payables and bank debt, since in the case of a substitution (complementarity) effect we should find a negative (positive) relationship between these two variables. We control for firms' characteristics and quality, since these aspects can affect their capability to access bank credit (and the link between bank credit and credit from suppliers). It is apparent that we deal with a framework that is relatively complex. Thus, to explore the links among our variables, we do not use traditional regressions but rely on Structural Equation Modelling. In addition, because of the time effect between the change in the sales and change in the working capital, we rely on lagged variables.

Our evidence suggests that firms tend to follow a substitution logic: they finance their additional working capital needs with debt and switch to payables when they are not able to

access bank debt. The results hold also for weak and high-quality firms and are robust to alternative variables.

This paper is organized as follows: the next section presents a review of trade credit and bank credit for SME financing. Our data set, variables and methodology are described in the section three, followed by the empirical analysis and robustness checks. The last section discusses our main findings and concludes.

2. Theoretical Framework

The amount of finance needed to cover operations (i.e., working capital) depends on the cash conversion cycle: the greater the amount of stock of raw material and the longer the time to produce the final product and/or the time to sell the product and cash in from the sale, the larger is the amount of finance needed. In fact, not all the cash available to the firm is used to cover the financial needs linked to the cash conversion cycle. Kling (2018) proposes a theory of operational cash holding based on the cash conversion cycle (Gitman, 1974; Richards and Laughlin, 1980). His model suggests that firms do not cover short-term needs entirely by using the cash available but rely on short-term bank debt and on suppliers' finance. In fact, because of uncertain cash flows, firms retain precautionary cash holding in case debt holders impose financial constraints. Cash holdings, in turn, reduce insolvency risk, enhancing access to short-term finance so that they also have an indirect effect on firms' capability to access alternative sources of short-term finance (Belghitar and Khan, 2013; Kling et al., 2014). All in all, not only are cash holdings retained for operational needs but also are kept to address unexpected shocks and facilitate credit access (Kling, 2018; Lins et al., 2010). Past research also suggests that a longer cash conversion cycle is associated with smaller liquid reserves (Deloof, 2001; Kim et al., 1998) and that there is a positive relationship between cash holdings and payables but a negative one between cash holdings

and receivables (Wu et al., 2012). Finally, cash holdings of the supplier can have a significant redistribution effect: cash-rich SMEs are found to be more likely to extend trade credit supporting business partners that have to rely on such credit because of difficulties in accessing bank financing (McGuinness et al., 2018).

However, as suggested by Kling (2018), cash holdings are not the only factor affecting firm's capability to access further short-term credit: those firms that perform better have a propensity to apply for cheaper bank debt (Biais and Gollier, 1997; Petersen and Rajan, 1997) and are more likely to be successful in applying for bank finance (Baas and Schrooten, 2006; Berger and Udell, 2006). In fact, small, young and opaque firms typically struggle to access bank finance (Berger and Udell, 2006; Boissay and Gropp, 2007; Howorth and Reber, 2003): when they are young they lack a long and established history that proves that they are successful (Huyghebaert and Van de Gucht, 2007) and they are not able to exploit a consolidated social capital (Ferrary, 2003; Howorth and Moro, 2006). They can even be adversely affected by banking lending strategy because of a misinterpreted level of risk attached to them (Samatas et al., 2019). When firms are more established, they suffer from information asymmetry (Van Caneghem and Van Campenhout, 2012; Wette, 1983) because of their lack of willingness to share information (Lowry et al., 2014; Rheinbaben and Ruckes, 2004) or lack of capability to provide lenders with the information they need (Dell'Ariccia and Marquez, 2004; Moro et al., 2015). The consequence is that lenders face moral hazard issues (Berger et al., 2005) that can only partially be sorted out via the request of additional collateral and cannot be solved by any rise in interest charged to the firm, since the latter can even increase the moral hazard issues (Stiglitz and Weiss, 1981; Wette, 1983). When firms face liquidity tightening or are credit rationed, they have to explore and consider alternative sources of finance that are more expensive, and, among them, trade credit plays a major role (Burkart and Ellingsen, 2004; Kling, 2018).

Trade credit in the form of credit provided by the supplier (payables) is a very popular source of finance for any type of firm, accessible to them since their inception. Research suggests that there are two major forms of trade credit (Cuñat, 2006). The first is called a one-part contract and gives the customer the choice of settling the invoice immediately or delaying the payment for a period of time: delaying the payment for a period of time is a form of "free" credit to the customer. The second type is called two-part contract. In this case, the customer has two alternative options: either to settle the invoice immediately and enjoy a discount or delay the payment and lose the discount. Actually, both forms of trade credit are popular, the use of the one-part or two-part contract being mainly linked to the country/region's culture or the established habits at the industry level (e.g., in the U.S. Ng et al. (1999) find that trade credit is offered by only one-fourth of US firms, while in Germany, it is very popular). Intriguingly, questions can be raised about the rationality of relying on the two-part contract, since the offered discounts (e.g., 3% for a payment due in 60 days) imply that trade credit bears high costs, up to 40%+ (Elliehausen and Wolken, 1993; Kohler et al., 2000; Petersen and Rajan, 1994; Summers and Wilson, 2002), even if some research finds opposite evidence (Marotta, 2005). In fact, determining the cost of a two-part contract is quite complex: on the one hand, further credit extension is typically provided for free; on the other hand, late payers can incur nonmonetary costs such as suppliers' refusal to provide material/services in the future or the denial of trade credit.

Interestingly, the suppliers of informationally opaque firms are in a good position to evaluate their customers' creditworthiness (Mian and Smith, 1992; Tsuruta, 2008). The direct access to data about regular payments and about customers' quality (exploiting the network of business relations the suppliers have) allows suppliers to obtain detailed and timely information about customers' current situation (Smith, 1987). The consequence is that as long as the customer is quite regular in paying the suppliers, suppliers' credit can be easier to

access than bank credit. Thus, firms can follow the approach of substituting bank credit with trade credit when they struggle to access the former. Hernandez-Canovas and Martınez-Solano (2007) find a substitution relation between trade and bank credit, since the payables compensate for a reduction in the use of bank credit arguably because of firms' difficulties in accessing bank debt. Similarly, Ogawa et al. (2013), by using micro data of Japanese small firms, find that SMEs, especially small and young firms with little access to bank credit, depend on large suppliers that support them by granting trade credit. As far as the European context is concerned, evidence suggests that bank credit–rationed SMEs in euro areas are more likely to use payables to finance their working capital (Casey and O'Toole, 2014).

However, even when firms are able to access bank credit, they may want to keep alternative sources of finance open for different reasons. First, relying too much on one or few banks (with one bank that serves as the main one) can be dangerous, since it can grant the bank an information advantage that can generate a holdup problem for the firm (Farinha and Santos, 2002; Howorth et al., 2003; Ongena and Smith, 2001). In this context, payables may turn to be a viable – though not inexpensive – alternative to bank finance (Matias Gama and Van Auken, 2015) that allows firms to reduce their dependence on the bank(s). Second, payables can be quite easily extended when the buyer is not able to pay on time and, as long as such an extension happens only occasionally, it is typically granted for free (Cuñat, 2006; Tsuruta, 2008). At the same time, any extension on a bank loan is subject to complex renegotiations and additional costs. In these scenarios, the extra cost linked to the use of trade credit can be interpreted as an "insurance premium" that the firm pays to diversify its sources of finance so that it can 1) reduce the holdup issue and 2) keep alternative sources of finance open (Cuñat, 2006). The insurance role is supported by recent research that indicates that payables are a significant complement to bank credit for SME financing during financial crises (Carbó‐Valverde et al., 2016; Mcguinness and Hogan, 2016; Psillaki and Eleftheriou,

2015).

Research finds evidence of the complementarity between payables and bank credit: Uesugi and Yamashiro (2008) and Taketa and Udell (2007) discover that small firms in Japan are bank dependent but view payables and loans as complementary debt instruments rather than substitutes. Mcguinness and Hogan (2016) argue that even though SMEs rely more on bank finance, payables play an important role in easing the financial burden during financial crises, and Huyghebaert et al. (2007) point out that the financing behaviour of SMEs is driven by the different position that bank lenders and suppliers take in the case of financial distress: compared to bank lenders, suppliers are willing to help by renegotiating the outstanding debt or by granting additional debt. Thus, suppliers are perceived as a complementary source of finance. Andrieu et al. (2018) also provide empirical support for a complementarity by using survey data on European SMEs from 2009 to 2014.

As discussed so far, the large majority of literature explores the relationship between bank credit and trade credit by looking at US, European or Japanese SMEs (Casey and O'Toole, 2014; Psillaki and Eleftheriou, 2015; Uesugi and Yamashiro, 2008). However, China is the second largest economy in the world and is characterized by a bank-based financial system (even though equity market and corporate bond market have been developing rapidly in recent years). This implies that Chinese firms have to rely more on debt financing (i.e., bank lending and possibly trade credit) to raise external funds. Statistics on Aggregate Financing to the Real Economy (AFRE) by the People's Bank of China reveal that bank loans take a share of 68.13% in total outstanding financing provided by the financial system to the real economy (2017), while net financing from corporate bonds represents 10.55% and equity 3.81%. However, in China, bank lending is significantly biased towards larger firms, especially those state-owned enterprises that are in possession of helpful political affiliations and implicit guarantees by the government (Wu et al., 2014). Du et al.

(2015) investigate the financing behaviours of Chinese private SMEs during 2000–2006 and find that building social capital does help them to raise more short-term debt and political affiliations could be helpful in obtaining long-term debt. In contrast to state-controlled firms, Chinese SMEs are more likely to turn to trade credit or other channels of informal financing, due to the limited bank finance they can access.

In China, trade payables typically bear an early payment discount. For example, Chinese suppliers often offer an early payment discount (2/10, net 30), which means that if buyers settle within 10 days after delivery, they can obtain a 2% discount on the total payment. Otherwise, they need to make the full payment within 30 days of delivery. This means that buyers could receive a trade credit (deferred payment) for 20 days at an annualized interest cost of 36.5%, which is a much higher rate than that of bank loans with a similar maturity. Irrespective of the fact that in China trade credit bears quite a high cost, trade payables represent a large share of Chinese firms' current liabilities: the average use of trade payables by Chinese nonfinancial listed firms has increased by nearly triple from 1023.61 million RMB in 2008 to 3457.01 million RMB in 2017, and it represents 48.43% of the average firm's current liabilities and 41.28% of total liabilities (2017 data). At the same time, the average use of short-term loans by Chinese nonfinancial listed firms almost doubled (from 739.65 million RMB in 2008 to 1700.31 million in 2017). The proportion in the average firm's current liabilities declined from 32.31% (in 2008) to 22.59% (in 2017) and in the average firm's total liabilities from 28.07% (in 2008) to 18.50% (in 2017). This evidence suggests a substantial increase in the financial needs of Chinese firms that was covered by both bank and trade credit, even if the latter played a greater role, possibly suggesting easier access to trade credit with respect to bank credit. As far as SMEs are concerned, they experienced a similar trend in the use of short-term loans and trade payables during the period of 2008–2017. Specifically, the average use of payables by nonfinancial listed SMEs

in China increased from 181.49 million RMB in 2008 to 894.44 million RMB in 2017, and it represented 49.21% of their current liabilities in 2017 (48.53% in 2008). At the same time, even though their average use of short-term loans also increased from 154.74 million RMB in 2008 to 710.60 million RMB in 2017, this proportion in their current liabilities was reduced from 31.32% in 2008 to 23.60% in 2017. The statistic suggests that SMEs also increased the use of credit (bank and trade) to finance their activities, with a prevalence of trade credit with respect to bank debt. All in all, the data provide some evidence of preference towards trade credit debt for both larger and smaller Chinese firms, even if this is not clear evidence of substitution.[1]

In addition to the general statistics, only recently has research started to explore this area. Allen et al. (2005) emphasize that trade credit makes a great contribution to China's economic growth, especially for the private sector. Ge and Qiu (2007) find that non-state-owned firms use more trade credit than state-owned ones in China to fund their potential growth opportunities. Wu et al. (2014) explore the determinants of trade credit in China and find that more trade credit is provided in areas with a higher level of regional social trust. As far as the relationship between bank credit and payables, both Zhu et al. (2007) and Huang et al. (2011) find that payables substitute for bank loans for private firms that are shut out of formal credit markets. However, Du et al. (2012) suggest that payables cannot effectively substitute for bank loans. Interestingly, Lin and Chou (2015) indicate that both a complementary and substitution effect coexist, since they find there is a substitution effect between bank credit and accounts payables but a complementary effect between bank credit and accounts receivables. Their findings are similar to the work of Yang (2011) using U.S. data.

However, a major question remains unanswered: do SMEs use trade credit because

[1] All the data are obtained from Wind database.

they are bank credit constrained, or do they expand trade credit as a hedging strategy in order to counterweight any further reduction of credit from banks? In other words, are Chinese firm implementing a substitution strategy (because of difficulty in accessing credit) or are they implementing a complementarity strategy (to deal with the risk of being credit constrained)?

3. Methodology and Data

3.1 Methodology

The use of payables is mainly driven by firms' need to finance their working capital, that is, stock and receivables issued by the firm, as suggested by Kling (2018)'s model. In turn, as discussed above, the use of payables can be affected by firms' quality and the accessibility of short-term bank credit (Belghitar and Khan, 2013; Kling, 2018; Kling et al., 2014; Lins et al., 2010). All in all, the use of payables is the result of the demands of working capital finance and the capability to access short-term finance. Thus, the dynamics can hardly be described with a standard linear regression (or two simultaneous linear regressions) model because of the interdependence of trade credit and bank credit and the fact that both are in turn affected by variables that are interrelated. In other words, what affects the trade credit/bank debt mix is the result of relatively complex links that cannot be easily captured by a simpler linear regression model.

We explore the determinants of the use of payables and its substitution or complementarity with bank credit by using a structural equation modelling analysis (Figure 1).

FIGURE 1 HERE

Our model focuses on changes in the levels of the variables. It looks jointly at what

affects the change in working capital needs of the firm (change in sales, change in stock, change in receivables) and what affects the capability of the firm to access different sources of finance in order to cover the working capital needs (change in bank credit and change in suppliers' credit). In detail, it suggests that the change in the sales of the firm affects both the change in stock and the change in receivables issued by the firm and, thus, the change in working capital needs of the firm. The firm can finance the additional working capital by using payables (easier to access but more expensive) and bank credit (cheaper but harder to access): If the firms follow the substitution logic, they will tend to have a negative relationship between the change in bank debt and the change in payables, in the sense that an increase in the demand for working capital will trigger a greater use of payables. If, on the other hand, firms follow the complementarity logic, they will finance the additional working capital needs by expanding both payables and bank debt, and, thus, the relationship will be positive. A third possible, even if quite unlikely, scenario could be that the use of payables and bank debt are completely independent from each other, and in this case their relationship will not be significant. To control for firms' capability to access bank credit, we also consider changes in firm performance (i.e., profitability, etc.) and changes in cash holdings: we expect a positive relationship between firms' performance measure and the amount of bank debt used to support working capital needs, since for more profitable and solid firms it is easier to access bank finance than for weaker ones; in addition, following Kling (2018), we expect a greater use of bank credit to be associated with greater cash holdings.

Interestingly, the increase in sales implies an immediate effect on the amount of account receivables and stock needed to satisfy customers requests. This implies that the firm faces an almost immediate effect in terms of increased working capital needs. At the same time, the evaluation of the creditworthiness of the firm from the bank point of view is based on the official annual (occasionally semi-annual) financial report. This implies a time lag

between the performance of the firm and the use of bank debt. Thus, in the model we assume that the past year (one-year lag) change in firms' performance affects their capability to access bank credit.

Moreover, additional variables are included to capture the financial status and operational situation of SMEs, which may produce a significant impact on their financing behaviour. These variables include return on equity (*ROE*), cash holding to total asset (*cash*), change in (growth rate of) total profit (*gprofit*) and change (growth rate of) sales (*gsale*).

3.2 Data

Even if China is a bank-based economy, SMEs have been confronted with financial constraints, especially after the financial crisis, as the supply of bank loans flowed to larger firms because of safety consideration. In such a context the use of payables increased, and they now make up a larger share of firms' current liabilities. In fact, the total size of payables in China has experienced a fourfold increase from 181.49 million RMB in 2008 to 717.91 million RMB in 2016, and they represented 51.06% of firms' current liabilities and 44.46% of total liabilities in 2016 (Wind dataset). To test the dynamics between payables and bank credit, we use 1,525 Chinese small and medium companies listed on the SME and GEM (Growth Enterprise Market) boards, obtained from the Wind dataset. Listed companies in China have to follow strict regulatory requirements in terms of information disclosure that allows for accessing detailed financial statement. In addition, there are externally audited procedures for listed companies so that the financial information can be considered reliable.

Our sample covers the period of 2008–2016 in order to examine the financing choice between payables and bank debt after the recent financial crisis. To mitigate the impact of outliers, we winsorize variables at 1% and 99%, including *ROE* and *gprofit*.

TABLE 1 HERE

Table 1 shows that Chinese SMEs have a high level of cash holding (averaging 24.53% of total assets, 463.1 million RMB). Firms in the sample hold a relatively lower amount in bank loans (averagely 328.2 million RMB) than in payables (averaging 421.9 million RMB). In terms of growth, sample firms present an average annual growth rate of 23.81% in sales. Meanwhile, Chinese SMEs present sound profitability in terms of average return on equity (15.47%) and growth rate of total profit (24.62%).

4. Analysis

The model considers a cash conversion cycle that is shorter than one year, i.e., any change in sales generates a change in working capital needs that is absorbed the same year. Thus, the model explores the relationship between any change in sales, change in stock/receivables and related change in short term loans/payables in the same year (*t*). As discussed above, the lagged variables are those related to change in cash holding and change in the performance of the firm, since for the performance of the firm to influence its credit access, it has to be visible to the bank, i.e., already recorded in the annual financial report. Thus, it has to be the previous year's performance (*t-1*). The results of the regressions of the structural equation model (SEM) are reported in Table 2 (first set of regressions).

TABLE 2 HERE

In general terms, the model presents Bentler and Raykov (2000) squared multiple correlations between .007 and .604. The root mean squared error (RMSE) of approximation is .061 below the upper 90% bound of .069, suggesting a proper fit of the model. Akaike

(1987)'s information criterion is 534,238.953, while the Bayesian information criterion 534,371.046 (Schwartz, 1978). The comparative fit index is .971, while the Tucker-Lewis index is 0.936, both relatively close to 1, suggesting quite a good fit (Bentler, 1990). Finally, the standardized root mean squared residual (SRMR) is .033, below the suggested threshold of .08 (Hancock and Mueller, 2006), indicating a sound goodness of fit of our model.

Moving forward to the detailed analysis of the framework, the structural equation model provides support to our basic arguments. The change in sales positively affects both the change in stock and the change in trade receivables: greater sales imply a greater need for stock in terms of raw material, work in progress and final products to be sure that customers' requests are met. Similarly, any positive change in sales implies a significant positive change in the receivables: firms tend to sell on credit, and any increase in sales implies an increase in the receivables issued by the firm. Thus, as expected the increase in sales implies a positive change in the working capital needs of the firm.

The model also explains that any increase in stock needs is financed by the firm using both short-term loans and payables, since both paths are positively related to stock and are significant. Similarly, the increase in the amount of credit given to customers is financed both by the short-term loans and by the use of credit provided by suppliers, since also in this case the change in stock and change in receivables are positively related to the change in payables.

An increase in short-term loans implies a decrease in payables (-.091). This relationship suggests that firms that can access short-term debt to finance their working capital use payables less, or, put another way, there is a substitution in the use of debt and payables. The change in short-term loans is negatively but not significantly related to firms' change in return on equity. In other words, a profitable firm has a reduced need for credit since it is able to finance (at least partially) its current activities with the profit it generates. At the same time, weak firms struggle to access finance from banks and thus should lean on

their suppliers more and more as a source of finance. A change in firms' cash holdings has a negative and significant impact on the use of both bank debt and trade payables. This evidence is a bit unexpected since, according to Kling, a reduced amount of cash holdings should have a negative effect on access to bank credit (Kling, 2018) and, considering the emerging substitution effect that we discovered, a possible positive effect on the use of suppliers' credit.

To explore further the role of supplier credit and bank credit, we run two additional tests. First, we re-estimate the model adding a path between payables and financial performance of the firm. The path is not significant (marginally) and negative, suggesting that, if there is any relationship between firm performance and use of payables, this is negative (weaker firms rely more on payables). This evidence provides support to the model proposed by Kling (2018).

Second, we re-estimate the model by splitting the sample into three subgroups and considering the top third and bottom third of firms. To identify the firms belonging to the bottom and top thirds, we clustered them according to their average change in performance in the period. The change in performance was measured exploring the growth of the firms and their growth in profitability in terms of *ROE*. The results are reported in Table 2 (second and third set of regressions).

In general terms, the Bentler and Raykov (2000) squared multiple correlations are between .001 and .819 in the case of top third of firms and between .046 and .526 in the case of the bottom third of firms. Akaike (1987)'s information criterion is 121,841.354 in the case of top firms and 229,599.077 in the case of the bottom ones. The comparative fit index is .995 (top) and .850 (bottom) relatively close to 1, suggesting quite a good fit (Bentler, 1990). Finally, the standardized root mean squared residual (SRMR) is .019 (top) and .080 (bottom), below the suggested threshold of .08 (Hancock and Mueller, 2006).

Turning our attention to top firms, the SEM suggests that any change in sales increases the trade receivables issued by the firms as well as the stock, even if in the latter case the relation is not significant. The additional working capital is financed using both suppliers and bank credit. In addition, the relationship between short-term loans and the use of payables is negative and significant, supporting the substitution effect (-.095). This implies that strong firms tend to finance the increase in working capital by substituting debt and payables.

In the case of weak firms, an increase in sales has a positive impact on both receivables and stock. The additional stock positively impacts both the use of short-term debt and the use of payables to suppliers (positively and significantly related to payables and to short-term loans) and receivables (positively and significantly related to payables and short-term loans). In addition, any increase in the use of short-term debt has a significant effect on the use of payables by reducing it (-.126). The coefficient is bigger than in the case of strong firms. This may suggest a greater impact of the substitution effect. However, any interpretation based on comparing the coefficients has to be done carefully, since the overall impact is the result of the joint effect of the coefficient and the value by which it is multiplied. All in all, also in the case of weak firms, evidence suggests that firms finance their additional working capital needs with both bank and supplier finance. However, the evidence suggests a possibly stronger substitution effect, conceivably linked to the fact that weak firms struggle to access additional finance and thus are forced to rely more on suppliers to support their growth.

4.2 Robustness checks

It can be argued that our results are affected by the way in which we measure the variables. In fact, we look at the change in sales that affects the change in stock and

receivables that in turn is expected to affect the change in short-term debt and the change in payables. It can be argued that this is not the right approach, since the levels of stock and receivables determine the overall amount of finance needed. In turn, banks' decision to lend (which we find to impact the use of payables) is affected by the amount of credit asked for by an organization. All in all, it can be pointed out that we should look at the levels of the variables instead of the change. Thus, we re-estimate the model using levels of core variables in year *t* including short-term loans (*shortloans*), payables (*trade_p*), stock (*stock*) and receivables (*trade_r*), and one-year-lagged levels of controls including return on equity (*lROE*), cash holding (*lcash*) and total profit (*ltprofit*). The results of the regressions of the SEM are reported in Table 3A (Robustness tests with levels of variables).

TABLE 3 Panel A and B HERE

When we look at the overall model, the Bentler and Raykov (2000) squared multiple correlations are between .166 and .786. Akaike (1987)'s information criterion is 878,135.598. The comparative fit index is .922, relatively close to 1, suggesting quite a good fit (Bentler, 1990). Finally, the standardized root mean squared residual (SRMR) is .046, below the suggested threshold of .08 (Hancock and Mueller, 2006). As far as the demand side of working capital is concerned, the SEM suggests that all the relationships between key variables maintain the same direction and significance. In particular, the substitution effect is confirmed: the short-term loans coefficient is negative and significant (-.046). When we look at the subsamples (not reported for reasons of space), both strong firms and weak firms present a negative relationship between the amounts obtained in short-term loans and payables, with coefficients of -.109 and -.090 respectively.

It can also be argued that the results we obtain are affected by the variables we use. In

particular, there are different ways to measure the performance of an organization, and financial institutions typically rely on a battery of measures to decide whether to lend. To address this limitation, we re-estimate the model using alternative measures of performance and cash holding: return on asset (*ROA*) and growth rate of asset (*gasset*). In addition, we include the liquidity ratio (*LR*) as a replacement or cash holding (*cash*), since firms' decisions to use bank short-term loans or payables to finance their working capital needs can also be affected by the liquidity of the firm. This happens for two reasons. First, more liquid firms are perceived as lower risk by the bank, while less liquid ones are considered higher risk, since there is greater concern about their capability to repay loans. If it is more likely that less liquid firms are credit constrained by banks, it is more likely that they use payables to finance their operation. Second, less liquid firms can lack enough internal cash to finance their additional working capital needs. Thus, they have to turn to external sources of finance. However, if the banks are not very supportive to finance them because they are considered higher risk, SMEs are forced to use more receivables. All in all, we can conclude that less liquid firms rely more on receivables and, for them, the substitution effect is in operation. The results are reported in Table 3B.

When we look at the overall model, the Bentler and Raykov (2000) squared multiple correlations are between .007 and .604. Akaike (1987)'s information criterion is 501,517.356. The comparative fit index is .972, relatively close to 1, suggesting quite a good fit (Bentler, 1990). Finally, the standardized root mean squared residual (SRMR) is .033, below the suggested threshold of .08 (Hancock and Mueller, 2006). As far as the analysis at variable level, there are no changes in the results in general. All in all, the additional econometric tests support further the substitution effect between bank credit and payables (-.09). When we look at the split dataset (i.e., strong vs. weak firms; results not reported here for reasons of space), the results support the substitution effect between bank credit and payables in both strong

firms (-.092) and in weak firms (-.130), and it is significant. The evidence also supports our argument about the possibility that the substitution effect is more relevant in the case of weak firms.

We also check whether our results are robust at industry level. In fact, there are industries that enjoy short cash conversion cycles and thus do not have major issues in financing their working capital needs, while those that face long cash conversion cycles have to rely heavily on loans and receivables. To pursue the analysis, we split the dataset into three subsamples: The first one contains construction, agriculture, science and technology, mining, and real estate firms (422 obs), that is, firms typically characterized by a long cash conversion cycle. The second subsample includes firms that operate in service and trade (766 obs), that is, firms that operate in contexts that typically enjoy a short cash conversion cycle. The third subsample contains manufacturing firms (4,269 obs) that are characterized by a mixed/dubious cash conversion cycle. Since data show the prevalence of firms that operate in manufacturing where the cash conversion cycle is dubious, it is important to look also at these firms in order to explore whether our original results are mainly affected by firms that have an uncertain cash conversion cycle. The SEM results are reported in Table 4A.

TABLE 4 Panel A and B HERE

In general terms, the Bentler and Raykov (2000) squared multiple correlations are between .000 and .797 in the case of long cash conversion cycle firms, between .012 and .538 in the case of short cash conversion cycle firms, and between .057 and .483 in the case of manufacturing firms. Akaike (1987)'s information criterion is 43,199.989 (long), 75,882.068 (short) and 404,312.563 (manufacturing). The comparative fit index is 1.000 (long), .935 (short) and .834 (manufacturing), relatively close to 1, suggesting quite a good fit (Bentler,

1990). Finally, the standardized root mean squared residual (SRMR) is .027 (long), .049 (short) and .080 (manufacturing), below the suggested threshold of .08 (Hancock and Mueller, 2006).

Interestingly, the results do not suggest any difference in the use of payables and bank credit. In the case of all three subsamples, firms follow the substitution logic: they use payables as a substitute for short-term bank loans when they are not available. The coefficient of short-term loans is negative in both cases, but it is -.092 in the case of the short cash conversion cycle, -.118 in the case of the long cash conversion cycle, and -.104 in the case of manufacturing firms. However, as already discussed, one cannot simply interpret this as evidence that, in the case of long cash conversion cycle firms, the substitution effect is greater than in the case of the short cash conversion cycle and manufacturing firms, since the impact is the result of the coefficient and value of the variable. Cash holding (*ldcash*) has a significant and negative impact on both the use of short-term loans and trade payables among manufacturing firms and the use of short-term loans among short cash conversion cycle firms, while it has an insignificant impact on the use of both short-term loans and trade payables among long cash conversion cycle firms. This indicates that a high level of cash holding in the case of manufacturing firms substitutes both short-term loans and payables: cash holdings are used to finance working capital. At the same time, in the case of firms that enjoy short cash conversion cycles, a high level of cash holdings reduces their use of short-term loans.

Finally, we also test the role of cash conversion cycles measured as “working capital days” that we define as receivables + stock – payables divided by total costs and multiplied by 365 as a control variable. The results are reported in Table 4B.

In general terms, the Bentler and Raykov (2000) squared multiple correlations are between .007 and .604. Akaike (1987)’s information criterion is 603,704.662. The

comparative fit index is .971, relatively close to 1, suggesting quite a good fit (Bentler, 1990). Finally, the standardized root mean squared residual (SRMR) is .030, below the suggested threshold of .08 (Hancock and Mueller, 2006). The relationship among our main variables remains the same as in our basic model. Additionally, this supplementary test provides support for the substitution effect between short-term loans and trade payables (-.09). Quite unexpectedly, working capital days (*ldCCC*) is negatively and significantly related to the use of short-term loans, while it is positively but not significantly related to the use of payables. This indicates that firms with longer working capital days are more likely to reduce their use of short-term loans, but this does not mean that they use more payables. Possibly, firms with a longer cash conversion cycle rely more on medium- and long-term loans to cover their working capital needs.

5. Conclusion

Trade credit plays a growing role in relieving financing constraints for SMEs, especially in emerging markets such as China. The relationship between payables and bank credit has received extensive attention. Existing literature has provided evidence for the existence of both substitution and complementarity between these two sources of financing by using different samples. Actually, the use of bank debt and payables is the result of firms' demand for working capital finance and capability to access short-term finance. Thus, the dynamics can hardly be described with a standard linear regression model. Our study explores the determinants of the use of payables and their substitution/complementarity with bank credit by using a structural equation modelling approach in the context of Chinese SMEs.

We find that the increase in stock and receivables is financed by both bank credit and payables. In addition, we find that bank credit and payables substitute each other.

Specifically, both strong firms and weak firms tend to finance the increase in working capital by expanding the use of both short-term debt and supplier finance. In addition, we find that weak firms present a bigger negative coefficient between short-term loans and payables. We tend to interpret this evidence as the fact that there is a stronger substitution effect, possibly linked to the fact that weak firms struggle to access additional finance and thus are forced to rely on suppliers to support their growth. However, we also stress the fact that the coefficients cannot be easily interpreted, since the impact is the resultant of the coefficients and the value by which they are multiplied.

We also run a series of tests to enhance the robustness of our analysis. First, we re-estimate the SEM model using levels instead of changes. Second, we re-estimate the model using alternative measures of performance and cash holding: return on asset, liquidity and growth rate of asset. The results show the persistence of the substitution effect. We also control for the possible effect of a different cash conversion cycle in different industries by splitting the sample firms into three groups: long cash conversion cycles (firms in construction, agriculture, science and technology, mining, real estate), short cash conversion cycles (firms in service and trade) and manufacturing (whose cash conversion cycle is dubious). The results confirm the substitution between bank credit and payables, and firms follows the substitution logic: they use payables as a substitute for short-term bank loans when the latter are not available. Finally, we explore whether the firm-specific cash conversion cycle affects the use of trade credit vs. bank credit. We use working capital days, defined as receivables plus stock minus payables divided by the total costs. The results do not change.

Our analysis relies on the Wind dataset, which focuses on financing data of firms. The fact that they are listed implies that they have to produce regular financial reports for the markets and that they are quite used to producing and disseminating information. This

implies that the firms in our sample are less opaque than smaller, unlisted firms. We cannot rule out that different results can be obtained by using more opaque firms that can face greater issues in accessing bank credit. Thus, the dataset used does not allow us to generalize our findings to smaller firms. However, the expectation is to find an even greater substitution effect in the case of more opaque firms. In fact, this limitation opens a further area of investigation: to explore whether the substitution effect is stronger in the case of smaller and more opaque firms. Since our evidence suggests a less pronounced substitution effect in the case of larger firms, it would also be interesting to explore whether large transparent firms tend to follow the substitution or the complementarity logic. An additional area of research is to explore whether the findings can be generalized to an alternative geopolitical context. In fact, previous research in Europe and the U.S. tends to provide different results, but such research tends to model the use of payables and bank short-term debt using linear models. We argue that SEM allows for a better exploration of the topic, since it allows us to consider the difference.

Notwithstanding the limitations, our study clearly indicates that in the case of small and medium listed firms in China, short-term bank debt and payables are used in an interchangeable way to finance additional working capital needs linked to additional receivables and stock.

References

Akaike, H., 1987. Factor Analysis and AIC. Psychometrica 52, 317–332.

Allen, F., Qian, J., Qian, M., 2005. Law, finance, and economic growth in China. J. financ. econ. 77, 57–116.

Andrieu, G., Staglianò, R., van der Zwan, P., 2018. Bank Debt and Trade Credit for SMEs in Europe: Firm-, Industry-, and Country-Level Determinants. Small Bus. Econ. 51, 245–264.

Baas, T., Schrooten, M., 2006. Relationship Banking and SMEs: A Theoretical Analysis. Small Bus. Econ. 27, 127–137.

Belghitar, Y., Khan, J., 2013. Governance mechanisms, investment opportunity set and SMEs cash holdings. small Bus. Econ. 40, 49–72.

Bentler, P.M., 1990. Comparative Fit Indexes in Structural Models. Psychol. Bull. 107, 238–246.

Bentler, P.M., Raykov, T., 2000. One Measure of Explained Variance in Nonrecursive Equation Models. J. Appl. Psychol. 85, 125–131.

Berger, A.N., Espinosa-Vega, M., Frame, S.W., Miller, N.H., 2005. Debt Maturity, Risk, and Asymmetric Information. J. Finance 60, 2895–2923.

Berger, A.N., Udell, G.F., 2006. A more complete conceptual framework for SME finance. J. Bank. Financ. 30, 2945–2966–2945.

Bharath, S.T., Dahiyab, S., Saunders, A., Srinivasan, A., 2007. So what do I get? The bank's view of lending relationships. J. financ. econ. 85, 368–419.

Biais, B., Gollier, C., 1997. Trade Credit and Credit Rationing. Rev. Financ. Stud. 10, 903–37.

Boissay, F., Gropp, R., 2007. Trade credit defaults and liquidity provision by firms. (No.

0753). Frankfurt am Mein.

Burkart, M., Ellingsen, T., 2004. In-Kind Finance: A Theory of Trade Credit. Am. Econ. Rev. 94, 569–590.

Carbó-Valverde, S., Rodriguez Fernandez, F., Udell, G.F., 2016. Trade Credit, the Financial Crisis, and SME Access to Finance. J. Money, Credit Bank. 48, 113–143.

Casey, E., O'Toole, C.M., 2014. Bank lending constraints, trade credit and alternative financing during the financial crisis: Evidence from European SMEs. J. Corp. Financ. 27, 173–193.

Cuñat, V., 2006. Trade Credit: Suppliers as Debt Collectors and Insurance Providers. Rev. Fianancial Stud. 20, 491–527.

Dell'Ariccia, G., Marquez, R., 2004. Information and bank credit allocation. J. financ. econ. 72, 185–214.

Deloof, M., 2003. Does Working Capital Management Affect profitability of Belgian Firms? J. Bus. Financ. Account. 30, 573–586.

Deloof, M., 2001. Intragroup Relations and the Determinants of Corporate Liquid Reserves: Belgian Evidence. Eur. Financ. Manag. 7, 375–392.

Deloof, M., Jegers, M., 1996. Trade Credit, Product Quality and Intragroup Trade: Some European Evidence. Financ. Manag. 25, 33–43.

Du, J., Guariglia, A., A., N., 2015. Do Social Capital Building Strategies Influence the Financing Behavior of Chinese Private Small and Medium–Sized Enterprises? Entrep. Theory Pract. 39, 601–631.

Du, J., Lu, Y., Tao, Z., 2012. Bank loans vs. trade credit: Evidence from China. Econ. Transition, 20, 457–480.

Elliehausen, G.E., Wolken, J.D., 1993. The demand for trade credit: an investigation of motives for trade credit use by small businesses[J]. Fed. Reserv. Bullettin 79, 929.

Farinha, L.A., Santos, J.A.C., 2002. Switching from Single to Multiple Bank Lending Relationships: Determinants and Implications. J. Financ. Intermediation 11, 124–151.

Ferrary, M., 2003. Trust and Social Capital in the Regulation of Lending Activities. J. Socio. Econ. 31, 673–699.

Ge, Y., Qiu, J., 2007. Financial development, bank discrimination and trade credit. J. Bank. Financ. 31, 513–530.

Gitman, L., 1974. Corporate liquidity requirements: a simplified approach. Financ. Rev. 9, 79–88.

Hancock, G.R., Mueller, R.O., 2006. Structural Equation Modelling: A Second Course. Informatipon Age Publisher, Charlotte, NC.

Hernandez-Canovas, G., Martınez-Solano, P., 2007. Effect of the Number of Banking Relationships on Credit Availability: Evidence from Panel Data of Spanish Small Firms. Small Bus. Econ. 28, 37–53.

Howorth, C., Moro, A., 2006. Trust within Entrepreneur Bank Relationships: Insights from Italy. Entrep. Theory Pract. 30, 495–517.

Howorth, C., Peel, M.J., Wilson, N., 2003. An Examination of the Factors Associated with Bank Switching in the U.K. Small Firm Sector. Small Bus. Econ. 20, 305–317.

Howorth, C., Reber, B., 2003. Habitual Late Payment of Trade Credit: An Empirical Examination of UK Small Firms. Manag. Decis. Econ. 24, 471–482.

Huang, H., Shi, X., Zhang, S., 2011. Counter-cyclical Substitution between Trade Credit and Bank Credit. J. Bank. Financ. 35, 1859–1878.

Huyghebaert, N., Van de Gucht, L., 2007. The Determinants of Financial Structure: New Insights from Business Start-ups. Eur. Financ. Manag. 13, 101–133.

Huyghebaert, N., Van de Gucht, L., Van Hulle, C., 2007. The Choice between Bank Debt and Trace Credit in Business Start-ups. Small Bus. Econ. 29, 435–452.

Kim, C.S., Mauer, D.C., Sherman, A.E., 1998. The determinants of corporate liquidity: Theory and evidence. J. Financ. Quant. Anal. 33, 335–359.

Kling, G., 2018. A theory of operational cash-holding, endogenous financial constraints, and credit rationing. Eur. J. Financ. 24, 59–75.

Kling, G., Paul, S.Y., Gonis, E., 2014. Cash holding, trade credit and access to short-term bank finance. Rev. Financ. Anal. 32, 123–131.

Kohler, M., Britton, E., Yates, A., 2000. Trade Credit and the Monetary Transmission Mechanism, The Bank of England Working Paper.

Lin, T.T., Chou, J.H., 2015. Trade Credit and Bank Loan: Evidence from Chinese Firms. Int. Rev. Econ. Financ. 36, 17–29.

Lins, K., Servaes, H., Tufano, P., 2010. What drives corporate liquidity? an international survey of cash holdings and lines of credit. J. financ. econ. 98, 160–176.

Lowry, P.B., Posey, C., Roberts, T.L., Bennett, R.J., 2014. Is Your Banker Leaking Your Personal Information? The Roles of Ethics and Individual-Level Cultural Characteristics in Predicting Organizational Computer Abuse. J. Bus. Ethics 121, 385–401.

Marotta, G., 2005. When Do Trade Credit Discounts Matter? Evidence from Italian Firm-Level Data. Appl. Econ. 37, 403–416.

Matias Gama, A.P., Van Auken, H., 2015. The Interdependence between Trade Credit and Bank Lending: Commitment in Intermediary Firm Relationships. J. Small Bus. Manag. 53, 868–904.

Mcguinness, G., Hogan, T., 2016. Bank credit and trade credit: Evidence from SMEs over the financial crisis. Int. Small Bus. J. 34, 412–445.

McGuinness, G., Hogan, T., Powell, R., 2018. European trade credit use and SME survival. J. Corp. Financ. 49, 81–103.

Mian, S.L., Smith, C.W., 1992. Accounts Receivable Management Policy: Theory and

Evidence. J. Finance 47, 169–200.

Moro, A., Maresch, D., Fink, M., 2015. Reduction in Information Asymmetry and Credit Access for Small and Medium- Sized Eneterprises. J. Financ. Res. 38, 121–143.

Ng, C.K., Kiholm-Smith, J., Smith, R.L., 1999. Evidence on the Determinants of Credit Terms Used in Interfirm Trade. J. Finance 54, 1109–1130.

Ogawa, K., Sterken, E., Tokutsu, I., 2013. The Trade Credit Channel Revisited: Evidence from Micro Data of Japanese Small Firms. Small Bus. Econ. 40, 101–118.

Ongena, S., Smith, D.C., 2001. The Duration of Bank Relationships. J. financ. econ. 61, 449–475.

Petersen, M.A., Rajan, R.G., 1997. Trade Credit: Theories and Evidence. Rev. Financ. Stud. 10, 661–691.

Petersen, M.A., Rajan, R.G., 1994. The Benefits of Lending Relationships: Evidence from Small Business Data. J. Finance 49, 3–37.

Psillaki, M., Eleftheriou, K., 2015. Trade Credit, Bank Credit, and Flight to Quality: Evidence from French SMEs. J. Small Bus. Manag. 53, 1219–1240.

Rheinbaben, J. von, Ruckes, M., 2004. The number and the closeness of bank relationships. J. Bank. Financ. 28, 1597–1615.

Richards, V., Laughlin, E., 1980. A cash conversion cycle approach to liquidity analysis. Financ. Manag. 9, 32–38.

Samatas, A., Makrominas, M., Moro, A., 2019. Financial intermediation, capital composition and income stagnation: The case of Europe. J. Econ. Behav. Organ. 162, 273–289.

Schwartz, G., 1978. Estimating the Dimension of a Model. Ann. Stat. 6, 461–464.

Shin, G.H., Kolari, J.W., 2004. Do some lenders have information advantages? Evidence from Japanese credit market data. J. Bank. Financ. 28, 2331–2351.

Smith, J., 1987. Trade credit and informational asymmetry. J. Finance 42, 863–876.

Stiglitz, J.E., Weiss, A., 1981. Credit Rationing in Markets with Imperfect Information. Am. Econ. Rev. 71, 393–410.

Summers, B., Wilson, N., 2002. An Empirical Investigation of Trade Credit Demand. Int. J. Econ. Bus. 9, 257–270; 252.

Taketa, K., Udell, G.F., 2007. Lending Channels and Financial Shocks: The Case of Small and Medium-Sized Enterprise Trade Credit and the Japanese Banking Crisis. Monet. Econ. Stud. 25, 1–44.

Tsuruta, D., 2008. Bank Information Monopoly and Trade Credit: Do only Banks Have Information About Small Business? Appl. Econ. 40, 981–996.

Uesugi, I., Yamashiro, G.M., 2008. The Relationship between Trade Credit and Loans: Evidence from Small Businesses in Japan. Int. J. Bus. 13.

Van Caneghem, T., Van Campenhout, G., 2012. Quantity and quality of information and SME financial structure. Small Bus. Econ. 39, 341–358.

Wette, H.C., 1983. Collateral in Credit Rationing in Markets with Imperfect Information: Note. Am. Econ. Rev. 73, 442–445.

Wu, W., Firth, M., Rui, O.M., 2014. Trust and the Provision of Trade Credit. J. Ban. Financ. 29, 146–159.

Wu, W., Rui, O.M., Wu, C., 2012. Trade credit, cash holdings, and financial deepening: evidence from a transitional economy. J. Ban. Financ. 36, 2868-2883.

Yang, X., 2011. The Role of Trade Credit in the Recent Subprime Financial Crisis. J. Econ. Bus. 63, 517–529.

Zhu, T., Xu, L.C., Cull, R., 2007. Formal finance and trade credit during China's transition, The World Bank.

Figure 1: SEM framework

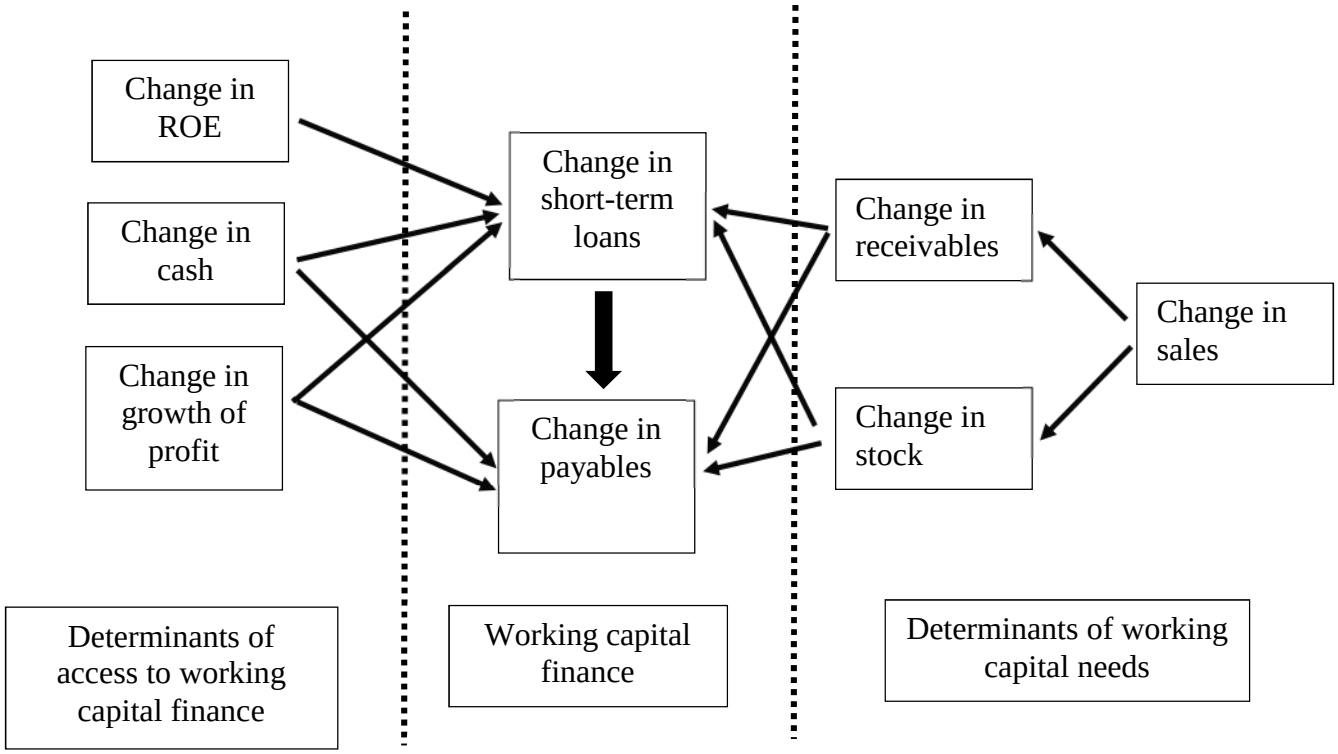

Table 1: Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
trade_p	12,196	421.9	1557	0	53912
dtrade_p	10,666	85.37	436.4	-3954	18786
trade_r	12,196	443.9	1064	0	48336
dtrade_r	10,666	100.3	415.1	-5257	19791
shortloans	9,048	328.2	833.8	0	25010
dshortloans	7,048	64.78	386.2	-5034	9513
stock	11,943	356.8	1599	0	88924
dstock	10,416	65.31	436.9	-4257	21109
gsale	11,616	23.81	59.21	-97.5	3781
ROE	12,190	15.47	13.39	-15.29	63.66
dROE	10,656	-2.39	9.183	-72.13	78.01
ldROE	9,129	-2.72	9.32	-63.98	75.69
gprofit	11,612	24.62	127.6	-612.7	685.5
dgprofit	10,082	-0.16	181.2	-1298.19	1298.19
ldgprofit	8,553	-5.63	168.22	-1298.19	1298.19
cash	12,196	24.53	17.26	0.112	96.03
dcash	10,666	-0.31	14.07	-74.04	71.79
ldcash	9,137	-0.33	14.55	-74.04	71.78
sale	12,196	1329.84	2115.98	75.56	14144.01
lsale	10,666	1226.237	1977.66	75.56	14144.01
tprofit	12,196	134.99	204.89	-166.21	1325.99
ltprofit	10,666	123.72	187.10	-166.21	1325.99
ROA	12,196	11.34	8.93	-7.36	44.62
dROA	10,666	-1.31	5.85	-51.99	51.99
ldROA	9,137	-1.48	5.94	-38.41	51.98
LR	12,196	3.54	5.561	0.07	190.9
dLR	10,666	0.14	5.055	-145.68	104.01
ldLR	9,137	0.14	5.37	-145.68	104.01
gasset	11,615	36.72	55.6	-17.49	326.3
dgasset	10,085	-0.56	79.79	-329.3	343.8
ldgasset	8,556	-0.71	81.88	-329.34	337.81

Table 2: SEM results on bank loans and trade credit

The table reports the regressions of the SEM model based on the entire sample, strong firms and weak firms, respectively. In regression 1, dshortloans is the change in the short-term loans and is the dependent variable that is expected to be influenced by dtrade_r (change in trade receivables), dstock (change in stock), ldROE (one-year-lagged change in return on equity), ldgprofit (one-year-lagged change in growth of profit) and ldcash (one-year-lagged change in cash holding of the firm). The second regression uses dtrade_p (the change in the trade payables) as the dependent variable, and the independent variables are dtrade_r (trade receivables), dstock (change in stock), ldgprofit (one-year-lagged change in growth of profit), dshortloans (the change in the short-term loans) and ldcash (one-year-lagged change in cash holding of the firm). Regression 3 models dtrade_r (change in the trade receivables) as a function of gsale (growth in sales). Regression 4 models dstock (change in stock) as a function of gsale (growth in sales).

	Overall firms				**Strong firms**				**Weak firms**			
VARIABLES	dshortloans	dtrade_p	dtrade_r	dstock	dshortloans	dtrade_p	dtrade_r	dstock	dshortloans	dtrade_p	dtrade_r	dstock
dtrade_r	0.251***	0.489***			0.0827***	0.683***			0.203***	0.417***		
	(0.00943)	(0.00902)			(0.0215)	(0.0195)			(0.0127)	(0.0111)		
dstock	0.114***	0.568***			0.0689***	0.564***			0.488***	0.594***		
	(0.00893)	(0.00816)			(0.00936)	(0.00865)			(0.0279)	(0.0247)		
ldROE	-0.464				-0.213				1.059			
	(0.752)				(1.263)				(1.205)			
ldcash	-1.164***	-0.869**			-1.428*	-0.950			-0.567	-0.741		
	(0.418)	(0.359)			(0.817)	(0.712)			(0.606)	(0.486)		
ldgprofit	0.00159	-0.0186			-0.0195	-0.119*			-0.00892	-0.0188		
	(0.0316)	(0.0240)			(0.0912)	(0.0721)			(0.0383)	(0.0245)		
dshortloans		-0.0908***				-0.0945***				-0.126***		
		(0.0122)				(0.0256)				(0.0171)		
gsale			2.995***	1.245***			3.208***	1.297			3.299***	1.490***
			(0.180)	(0.194)			(0.357)	(0.843)			(0.305)	(0.139)
Constant	25.53***	5.709	78.09***	66.88***	39.07***	-34.49***	76.68***	117.5***	19.70**	12.78**	63.17***	42.17***
	(5.537)	(4.687)	(8.080)	(8.706)	(11.21)	(9.461)	(15.33)	(36.16)	(7.811)	(6.152)	(13.99)	(6.369)
Observations	5,457	5,457	5,457	5,457	1,246	1,246	1,246	1,246	2,369	2,369	2,369	2,369

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Robustness tests with levels of variables and different control variables (overall firms)

Panel A reports the regressions of the SEM model based on the entire sample. In regression 1, shortloans is level of short-term loans and is the dependent variable that is expected to be influenced by trade_r (level of trade receivables), stock (level of stock), lROE (one-year-lagged return on equity), lcash (one-year-lagged cash holding of the firm) and ltprofit (one-year-lagged total profit of the firm). The second regression uses trade_p (level of trade payables) as the dependent variable, and the independent variables are trade_r (level of trade receivables), stock (level of stock), ltprofit (one-year-lagged total profit of the firm), lcash (one-year-lagged cash holding of the firm) and shortloans (level of short-term loans). Regression 3 models trade_r (level of trade receivables) as a function of lsale (one-year-lagged sales). Regression 4 models stock (level of stock) as a function of lsale (one-year-lagged sales).

Panel B reports the regressions of the SEM model based on the entire sample. In regression 1 dshortloans is the change in the short-term loans and is the dependent variable that is expected to be influenced by dtrade_r (change in trade receivables), dstock (change in stock), ldROA (one-year-lagged change in return on asset), ldLR (one-year-lagged change in liquidity ratio of the firm) and ldgasset (one-year-lagged change in growth in asset of the firm). The second regression uses dtrade_p (the change in the trade payables) as the dependent variable, and the independent variables are dtrade_r (change in trade receivables), dstock (change in stock), ldgasset (one-year-lagged change in growth in asset of the firm), ldLR (one-year-lagged change in liquidity ratio of the firm) and dshortloans (the change in the short-term loans). Regression 3 models dtrade_r (change in the trade receivables) as a function of gsale (growth in sales). Regression 4 models dstock (change in stock) as a function of gsale (growth in sales).

Panel A

	Robustness tests with levels			
VARIABLES	shortloans	trade_p	trade_r	stock
trade_r	0.381***	0.767***		
	(0.00719)	(0.0104)		
stock	0.103***	0.598***		
	(0.00465)	(0.00595)		
lROE	-4.835***			
	(0.613)			
lcash	-2.438***	4.406***		
	(0.535)	(0.665)		
ltprofit	-0.130**	-0.187***		
	(0.0503)	(0.0602)		
shortloans		-0.0462***		
		(0.0141)		
lsale			0.374***	0.348***
			(0.00543)	(0.00885)
Constant	232.8***	-224.3***	62.34***	-39.93*
	(16.76)	(18.08)	(13.76)	(22.43)
Observations	7,742	7,742	7,742	7,742

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Panel B

Robustness tests with different controls				
VARIABLES	dshortloans	dtrade_p	dtrade_r	dstock
dtrade_r	0.257***	0.488***		
	(0.00949)	(0.00904)		
dstock	0.114***	0.571***		
	(0.00901)	(0.00818)		
ldROA	-0.0697			
	(1.058)			
ldLR	-2.975	-0.161		
	(2.098)	(1.860)		
ldgasset	0.136	-0.104		
	(0.0835)	(0.0747)		
dshortloans		-0.0903***		
		(0.0121)		
gsale			3.012***	1.234***
			(0.181)	(0.194)
Constant	27.66***	6.601	78.76***	67.30***
	(5.430)	(4.703)	(8.106)	(8.711)
Observations	5,463	5,463	5,463	5,463

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Robustness tests at industry level and considering firm-specific cash conversion cycles

Panel A reports the regressions of the basic SEM model based on the subsamples including long cash conversion cycle firms, short cash conversion cycle firms and dubious cash conversion cycle firms, respectively.
In regression 1, dshortloans is the change in the short-term loans and is the dependent variable that is expected to be influenced by dtrade_r (trade receivables), dstock (change in stock), ldROE (one-year-lagged change in return on equity), ldgprofit (one-year-lagged change in the growth of profit) and ldcash (one-year-lagged change in cash holding of the firm). The second regression uses dtrade_p (the change in the trade payables) as the dependent variable, and the independent variables are dtrade_r (trade receivables), dstock (change in stock), ldgprofit (one-year-lagged change in growth of profit), dshortloans (the change in the short-term loans) and ldcash (one-year-lagged change in cash holding of the firm). Regression 3 models dtrade_r (change in the trade receivables) as a function of gsale (growth in sales). Regression 4 models dstock (change in stock) as a function of gsale (growth in sales).
Panel B reports the regression of the basic SEM. In regression 1, dshortloans is the change in the short-term loans and is the dependent variable that is expected to be influenced by dtrade_r (trade receivables), dstock (change in stock), ldROE (one-year-lagged change in return on equity), ldgprofit (one-year-lagged change in the growth of profit), ldcash (one-year-lagged change in cash holding of the firm) and ldCCC (which measures the cash conversion cycle of the firms). The second regression uses dtrade_p (the change in the trade payables) as the dependent variable, and the independent variables are dtrade_r (trade receivables), dstock (change in stock), ldgprofit (one-year-lagged change in growth of profit), dshortloans (the change in the short term loans) ldcash (one-year-lagged change in cash holding of the firm) and ldCCC (which measures the cash conversion cycle of the firms). Regression 3 models dtrade_r (change in the trade receivables) as a function of gsale (growth in sales). Regression 4 models dstock (change in stock) as a function of gsale (growth in sales).

Panel A

	Long cash conversion cycle firms				Short cash conversion cycle firms				Dubious/mixed cash conversion cycle firms			
VARIABLES	dshortloans	dtrade_p	dtrade_r	dstock	dshortloans	dtrade_p	dtrade_r	dstock	dshortloans	dtrade_p	dtrade_r	dstock
dtrade_r	-0.013	0.740***			0.320***	0.626***			0.177***	0.387***		
	-0.0356	-0.0432			-0.0373	-0.0305			-0.0097	-0.0090		
dstock	0.0571***	0.536***			0.221***	0.940***			0.549***	0.713***		
	-0.0119	-0.0148			-0.0607	-0.0479			-0.0235	-0.0221		
ldROE	2.71				2.037				-1.142*			
	-2.957				-2.991				-0.687			
ldcash	-0.444	-0.404			-2.951*	0.346			-0.892**	-0.939***		
	-1.95	-2.312			-1.69	-1.292			-0.3705	-0.3140		
ldgprofit	-0.122	0.0539			-0.0114	-0.092			0.015	-0.001		
	-0.132	-0.132			-0.123	-0.0815			-0.0288	-0.0215		
dshortloans		-0.118**				-0.092***				-0.104***		
		-0.059				-0.0283				-0.0135		
gsale			1.697***	1.028			2.141***	0.762***			3.448***	1.454***
			-0.658	-1.989			-0.39	-0.243			-0.2160	-0.0904
Constant	123.6***	-29.86	142.9***	404.7***	13.43	-26.76	139.8***	59.09***	2.726	7.480*	58.94***	33.79***
	-24.89	-28.96	-32.52	-98.25	-23.19	-17.28	-23.24	-14.46	-4.991	-4.139	-8.895	-3.721
Observations	422	422	422	422	766	766	766	766	4,269	4,269	4,269	4,269

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Panel B

	Cash Conversion Cycle			
VARIABLES	dshortloans	dtrade_p	dtrade_r	dstock
dtrade_r	0.251***	0.488***		
	-0.00944	-0.00904		
dstock	0.114***	0.569***		
	-0.00893	-0.00817		
ldROE	-0.63			
	-0.758			
ldcash	-1.201***	-0.866**		
	-0.42	-0.361		
ldgprofit	0.00349	-0.0179		
	-0.0317	-0.0241		
dshortloans		-0.0900***		
		-0.0122		
gsale			3.007***	1.255***
			-0.181	-0.195
ldCCC	-0.0580*	0.013		
	-0.0301	-0.027		
Constant	25.72***	5.476	78.01***	66.99***
	-5.545	-4.709	-8.093	-8.726
Observations	5,441	5,441	5,441	5,441

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix:

Table I: Variables description

This table presents descriptions of all the variables used in our analysis.

Variable	Description
trade_p	The sum of accounts payable, notes payable and advances in year *t* (million RMB)
dtrade_p	First-order difference of *trade_p*
trade_r	The sum of accounts receivable, notes receivable and prepayments in year *t* (million RMB)
dtrade_r	First-order difference of *trade_r*
shortloans	Short-term loans obtained from bank in year *t* (million RMB)
dshortloans	First-order difference of *shortloans*
stock	Goods in stock in year *t* (million RMB)
dstock	First-order difference of *stock*
gsale	Annual growth rate of sales in year *t* (%)
ROE	Return on equity in year *t* (%)
dROE	First-order difference of *ROE*
ldROE	One-year-lagged first-order difference of *ROE*
gprofit	Annual growth rate of total profit in year *t* (%)
dgprofit	First-order difference of *gprofit*
ldgprofit	One-year-lagged first-order difference of *gprofit*
cash	The ratio of cash and cash equivalents to total assets in year *t* (%)
dcash	First-order difference of *cash*
ldcash	One year lagged first-order difference of *cash*
sale	Sales in year *t* (million RMB)
lsale	One-year-lagged sales (million RMB)
tprofit	Total profit in year *t* (million RMB)
ltprofit	One-year-lagged total profit (million RMB)
ROA	Return on asset in year *t* (%)
dROA	First-order difference of *ROA*
ldROA	One-year-lagged first-order difference of *ROA*
LR	Liquidity ratio in year *t*
dLR	First-order difference of *LR*
ldLR	One-year-lagged first-order difference of *LR*
gasset	Annual growth rate of total assets in year *t* (%)
dgasset	First-order difference of *gasset*
ldgasset	One-year-lagged first-order difference of *gasset*