【論文】

Firm Growth in China: A Perspective of Informal Financing

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1. Introduction and background

Ever since the initiation of the "Opening-up Policy" in the late 1970s, China has witnessed continuously spectacular economic growth, at an average rate of 9.8% over the past three decades. As the largest emerging market with many years of uninterrupted fast growth, China presents us with an interesting case of study. While in the first quarter of 2016, the GDP growth rate has declined to 6.7%. The growth puzzle of China is not only an important topic to discuss in the growth literature, but also a special topic for understanding the economics of "New Normal", which can help us understand the sustainable development in China and the world better.

However, one strand of literature champions the view that the development of a financial system with a stock market and intermediation contributes to a country's overall economic growth (e.g., McKinnon, 1973). Later literatures provide support to this view by presenting empirical evidence at the country level (e.g., King and Levine, 1993; Levine and Zervos, 1998), as well as at the industry and firm level (e.g., Rajan and Zingales, 1998; Jayaratne and Strahan, 1996). However, China is an important counterexample to the finding in the finance-growth literature: Neither China's legal nor financial system is well developed, yet it has experienced the fastest economic growth (Allen et al., 2005). Specifically, the under-developed financial system is driven by the Chinese government's financial depressed policy, and it makes firms suffer from financial constraints.

In China, financial constraints are prevalent among firms, especially non-state firms. Financial constraints always harm Chinese privately owned firms' growth (Poncet et al., 2010; Firth, 2012; Chen and Guariglia, 2013; Ding et al., 2013), and the distorted financial and institutional systems make financial constraints even more severe. This situation is not exclusive to China; it has become a global problem. China's financial constraints can be categorized into three main types. First, financial depressed policy, which aims to drive rapid economic growth, and financing resource allocation is partial to local government, infrastructure industry and real estate market. These industries are less sensitive to interest rate, and they utilize financial resources inefficiently. Second, ownership's discrimination and government controlled banking system lead to the result that bank loan distribution

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being favorable to state-owned enterprises, and it has created barriers for non-state owned firms' access to bank loans. The banking discrimination against non-state owned firms also insulates non-state firms from formal financing (Brandt and Li, 2003; Lu et al, 2013). Third, because of the financial repression, the shadow banking and underground finance have extended rapidly. Among these, the usurious loan credit is the predominant and has deep influences on social and economic life. Therefore, firms who use these financial resources have to bear high debt cost, and the formal financial market has been distorted.

Therefore, understanding the financial constraints–financial intermediations–firm performance nexus is intriguing and meaningful for exploring the mechanism of growth miracle in China. Particularly, the nexus applies to the state sector and the listed sector, with arguably poorer applicable legal and financial mechanisms, the private sector grows much faster than the others and contributes the most to the economy's growth.

Regarding the firm's dimension, one concern is that China's economic growth is strongly related to Total Factor Productivity (TFP). Nobel Laureate Paul Krugman (1997) stated that "Productivity isn't everything, but in the long run it is almost everything". One line of research pays attention to examining economy-wide productivity growth in China by adopting TFP as a measure of technological change (Jefferson et al., 2008). Research on firm survival and growth generally characterizes that the likelihood of survival is essentially determined by firms' productivity (Ericson and Pakes, 1995; Asplund and Nocke, 2006). Specifically, it is demonstrated that firms with lower productivity are more likely to suffer continuous decreases in market share and are more likely to exit due to poor performance. Evidence of this productivity–survival link has been found in many pieces empirical research works. Studies of China (Song et al., 2011), USA (Foster et al., 2008), Chile, Colombia (Tybout, 1992; Eslava et al., 2004), Ghana (Frazer, 2005), Spain (Farinas and Ruano, 2005), and Taiwan (Aw et al., 2001) consistently demonstrate that the productivity of exiting firms are significantly lower than that of the surviving ones.

Working capital management is particularly important in the Chinese context, where firms are limited to access long-term capital markets (Ding et al., 2013; Zhang, 2016), or are facing financial constraints. Such firms therefore need to rely on internally generated funds, short-term bank loans, and trade credit to finance their activities. In line with this argument, it has been shown that effective working capital management has played a particularly important role in alleviating the influence of the 2008 financial crisis (KPMG China, 2011) and investment behavior (Ding et al., 2013). In addition, the presence of financial constraints and its effects on firms' investment decisions and performance have received intense interest in the corporate finance literature. There is considerable evidence on that financial constraints are detrimental to the investment and growth of firms in developing economies (Stein, 2003). To these firms, working capital may be used as an additional source of finance. In fact, little is known about whether or how working capital work or how much economic activity they support in China, especially under the financial constraints. In this chapter, we focus on firm performance-productivity and profitability, which are significantly related to growth (Chen and Guariglia, 2013). Specifically, we explore the role played by

working capital management in explaining the reason why Chinese firms are able to grow at high rates despite the significant financial constraints. Using an extensive and nationally representative database of non-listed Chinese firms (GUOTAIAN non-listed Chinese firms database), we hope to fill a part of the gap by examining the extension of working capital management, one of the mechanisms suggested by Hale and Long (2011), Ding et al. (2013) and Aktas et al. (2015) as an important financial intermediation in Chinese firms' growth, investment and profitability.

Furthermore, trade credit is a part of working capital. It is important to investigate the specific effect of trade credit. "Trade credit is a financing intermediation offered by suppliers to their customers, and the demand of trade credit (i.e., account of payable) represents the credit that a firm owes its suppliers for the goods which it has received but not yet paid" (Lin and Chou, 2015). Trade credit is typically regarded as a short-term informal financing instrument (Wu et al., 2014). Trade credit is more likely to be significant in explaining firm growth in China, where there is a relatively weak and capricious enforcement of contracts and discrimination in bank lending (formal financing). China therefore offers an opportunity to study trade credit in a state-dominated banking environment notorious for misallocating credit. China, a typically transitional and developing economy, provides a special perspective for other developing countries to study the relationship between trade credit and firm productivity for us to understand the mechanism of Chinese firms' growth better.

In this paper, we investigated the relationships between Chinese firms' TFP and net working capital, TFP and trade credit under the possible existence of financial constraints. We first analyzed how trade credit and net working capital as informal financial intermediations contribute to Chinese firms' TFP, focusing on four ownership types: state, collective, private and foreign. Second, we tested the extent to which firm heterogeneity, i.e., links to different ownership. We tried to explain the Chinese growth puzzle from an informal financing perspective.

2. Literature review

2.1 Working capital management and firm performance

Net working capital (NWC) is defined as the difference between firms' current assets (including accounts receivable, inventories, and cash) and current liabilities (including accounts payable and short term debt). It represents the source and use of short-term capital. Working capital is often used to measure a firm's liquidity. Liquidity is a precondition to ensure that firms are able to meet their short-term obligations. Insufficient liquidity is one of the reasons for bankruptcy (Dunn and Cheatham, 1993). Yet, too much liquidity may harm firms' profitability (Bhattacharya, 2001). Good management of working capital therefore requires a balance between liquidity and firm performance in order to maximize the value of the firm. The advantages of holding inventories and extending trade credit to customers are outlined as the followings. Yet, the higher the inventories and account of receivable are, the less the amount money is available to the firm for profitable investment. It suggests that it is difficult for firm managers to find out the optimal level of working capital (Deloof, 2003). The literature proposes several theoretical arguments to understand the relationship between working capital and firm performance.

Additional investment in net working capital is expected to have positive effects, in particular for firms with low level of working capital. It is because that working capital allows firms to grow by increasing sales and earnings. More inventories are known, among other issues, to reduce supply cost, to provide hedge against input price fluctuations, and to minimize the loss of sales due to potential stock-outs (see, e.g., Blinder and Maccini, 1991; Fazzari and Petersen, 1993; Corsten and Gruen, 2004). On the other hand, overinvestment in working capital may generate adverse effects and lead to value destruction for shareholders. Like any other investment, increases in working capital require additional financing, which leads to further financing and opportunity costs (see, e.g., Kieschnick et al., 2013). Therefore, ceteris paribus, firms with high working capital on their balance sheet also potentially face high interest expenses and bankruptcy risk. Moreover, too much cash tied up in net working capital might also prevent firms from value-enhancing investment projects in the short run (see, e.g., Ek and Guerin, 2011). The existence of potential benefits and costs implies therefore a non-linear relationship between working capital level and firm performance, with the expected relationship being negative for firms with high level of working capital (i.e., overinvestment in net working capital) and positive for the ones with low level of working capital (i.e., underinvestment in net working capital) (Baños-Caballero et al., 2014; Mun and Jang, 2015; Aktas et al., 2015).

In the Chinese context, firms have limited access to long-term capital markets. Therefore, working capital management is especially important. However, related studies are quite limited. In line with this argument, it has been shown that effective working capital management has played a particularly important role in alleviating the effects of the recent financial crisis in China (KPMG China, 2011). In addition, Hale and Long (2011a, 2011b) argue that the spectacular growth characterizing Chinese private firms in recent years is mainly due to their ability to manage working capital, their accounts receivable in particular, more efficiently than other firms. Moreover, firms characterized by high working capital display high sensitivities to investment in working capital than to cash flows and low sensitivities to investment in fixed capital than cash flows. An active management of working capital may help firms alleviate the effects of financing constraints on fixed investment (Ding et al., 2013). These findings suggest that working capital is an additional and important financial resource for Chinese firms, but the work on this issue is limited.

Therefore, our analysis tried to bridge the gap on the literatures about the net working capital management and Chinese firm performance from the perspective of financial constraints. We discussed each of the four distinct hypothesis.

2.2 Trade credit and firm performance

Furthermore, regards to trade credit, a number of studies adopt a micro perspective and use firm-level data to understand the link between financial development and growth in China. However, only a few focus on the relationship between specific sources of trade credit and firm growth, and the role trade credit playing on sustainable firm growth remains controversial (Garmaise and Moskowitz, 2003). One current firm-level approach is to research trade credit based on the behavior of both suppliers and receivers. Using NBS industrial firm-level data (1998-2003) to investigate the

efficiency of trade credit in China by analyzing the attributes of trade credit from supplier firms, Cull et al. (2009) argue that trade credit does not play an economically significant role in China. This is because that SOEs are the only ones who redistribute trade credit obtained from bank loans to non-state firms incidentally. However, non-SOEs actively exploit trade credit as an informal financing channel to overcome liquidity problems (Garnaut et al., 2001) and financial growth in China, where the formal financial sector is underdeveloped (Brandt et al., 2003; Ge and Qiu, 2007).

Another approach is to research the substitution and complementary effect of trade credit and bank loan. Some studies document that privately controlled firms tend to rely more on informal finance and trade credit, whereas SOEs do not, not even during financial crisis (Wu et al., 2014; Lin and Chou, 2015). Yano and Shiraishi (2012) also argue that financial intermediation through trade credit is more efficient than bank finance in economically developed coastal areas in China. However, Du et al. (2012), who explicitly compare the relative importance of bank loans and trade credit in promoting firm performance, and find out that due to bank discrimination in China (Brandt and Li, 2003), bank loans can improve firm performance more than trade credit. Yano et al. (2013) find that ethnic minority firms are more unwilling to repay trade credit than bank loans. Therefore, financial intermediation through trade credit to ethnic minority firms leads to inefficient financial allocation in Xinjiang.

However, the previous literature has not reached a consensus on whether or not trade credit presents an efficient financial intermediation in China. In particular, understanding the mechanism between trade credit and firm growth in China can help us understand the reason why that China grows so fast in spite of its underdeveloped financial system better. Therefore, there is a large gap needs to be filled in the literature, related to how trade credit influences firms' productivity by analyzing firm-level data in China. Based on the previous literature, our research focuses on whether financial intermediation through trade credit can promote the performance of Chinese non-listed firms or not, and whether trade credit can ease financial constraints under the heterogeneity (ownership, firm age and size) of enterprises and institutional environments in China or not.

3. Empirical specifications and estimation methodology

3.1 Baseline specification

As one of the most important measurements of growth, TFP (total factor productivity) reveals differences in economic growth and income levels across countries and regions (Caselli and Gennaioli, 2005; Hsieh and Klenow, 2010). Based on Chen and Guariglia's (2013) empirical model of cash flow and firm performance, we establish a model to find the determinants of TFP and reveal whether financial factors exert any effect. Specifically, we estimate our model as follows:

$$TFP_{it} = \alpha_0 + \alpha_1 TFP_{i,t-1} + \alpha_2 NWK_{it} * D + \alpha_3 NWK_{it} * (1 - D) + \alpha_4 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it}, \quad (1)$$

$$TFP_{it} = \alpha_0 + \alpha_1 TFP_{i,t-1} + \alpha_2 tc_{it} + \alpha_3 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it}, \quad (2)$$

where TFP_{it}[1] indicates the performance of firm i at time t; Net working capital (NWK) is

1 Due to the serial correlation of TFP (TFP follows a first-order Markov process (Levinsohn and Petrin (2003)), lagged TFP should be included to control for this problem.

our key explanatory variable[2]. D and (1-D) are dummy variables, if WK is negative (positive), and D (or 1-D) equals to 1, or else equals to 0. Trade credit is another key explanatory variable. Accounts payable scaled by total assets is used to evaluate trade credit[3]. All data in this paper has been deflated by deflators[4].

v_i is a firm-specific effect, which we control for regressing Eqs. (1 and 2) in first differences, and v_j is an industry-specific effect measured by an industry dummy. There are 37 industries, the basic industry being textile manufacturing (Brandt et al., 2012). v_t is a time-specific effect, and we control it using a time dummy. v_{jt} is used to control industry-specific business cycle effects (Guariglia et al., 2011; Chen and Guariglia, 2013). Finally, ε_{it} is an idiosyncratic error term.

These specifications enable us to test whether net working capital and trade credit influence Chinese firms' TFP.

3.2 Endogeneity problems

In examining the relation between net working capital and firm performance, one issue is the potential endogeneity of explanatory variables with respect to TFP. System GMM (Generalized Method of Moments) allows us to address the potential endogeneity problem because firms adjust inputs according to anticipants of shocks to productivity or profitability throughout the production process (Coricelli et al., 2012). Unobservable corporate-specific fixed effects affect ownership and financial constraints; simultaneous causality for financial constraints (Shailer and Wang, 2015); dynamic panel bias (Nickell, 1981; Arellano and Bond, 1991; Bond, 2002) exist.

In addition, we use two criteria to test that our estimations are reasonable.

First, we access the presence of nth-order serial correlation in the different residuals, which is denoted as $m(n)$ test. The estimations that we regress can be reasonable if these specifications are exempted from derail correlation in 1st-difference residuals. In the presence of serial correlation of order n, lags n+1 and deeper are required strictly in the instrument set (Brown and Petersen, 2009; Roodman, 2009). $m(n)$ test is asymptotically distributed as a standard normal distribution under the null hypothesis for no n-order serial correlation of the differenced residuals.

Second, to evaluate whether our instruments are legitimate and our model is correctly specified, we assess whether the variables in the instrument set are uncorrelated with the error term in the relevant equations. We use Hansen test (J test) to test overidentifying restrictions. The result of this test for instrument validity is asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the number of parameters. However, using system GMM to estimate a production function based on a large panel data, Sargan test tends to over-reject the null hypothesis of instrument validity (Blundell et al., 2000). As our panel data is of large number,

2 Consistently with previous studies (Fazzari and Petersen, 1993; Ding et al., 2013), current assets minus current liabilities scaled by total assets is used to evaluate working capital.

3 Consistently with previous studies (Choi and Kim, 2005; Lin and Chou, 2015), the trade credit variable is scaled by total assets.

4 Our data have been deflated by the deflators taken from the China Statistical Yearbook (various issues) published by the National Bureau of Statistics of China. We use the provincial capital goods deflator to deflate the capital variable and the gross domestic product (GDP) deflator to deflate other variables.

we choose Hansen test as a major reference.

4. Data and summary statistics

4.1 Data

We use data drawn from the annual financial accounts filed by industrial firms from non-listed firms in the GTA (GUOTAIAN) database[5] via CSMAR (China Securities Market & Accounting Research) over the period 2005-2009. This covers 41 industries and includes enterprises with annual sales of five million yuan (approximately US $650,000) or more. Due to data restrictions, "we have omitted observations with negative sales, negative total assets minus total fixed assets, negative total assets minus liquid assets, and negative accumulated depreciation minus current depreciation. Firms that do not have complete records on our main regression variables are also omitted. To control the potential influence of outliers, we exclude observations by the one-percent tails of each of the regression variables. We also omit all firms with less than 5 years of consecutive observations" (Guariglia et al., 2011). In addition to the above treatment, we further match the address, telephone number and industry code of firms and omit observations of firms with fewer than eight employees (Brandt et al., 2012). Finally, our panel covers 131,482 non-listed firms, corresponding to 757,423 firm-year observations (trade credit), and 118,356 non-listed firms, corresponding to 625,618 firm-year observations[6] (NWK).

4.2 Summary statistics

Table 1 displays the descriptive statistics of our key variables by year. With respect to firm performance, there is a steady increase in TFP (3.588~4.795) and ROS (0.015~0.031), separately. Turning to the financial variables, net working capital increases steadily (0.036~0.084). By further dividing the net working capital according to positive and negative, we find that generally the positive (negative) working capital working capital increases (decreases) steadily (0.036~0.084/-0.088~-0.073). Cash flow increases from 0.080 to 0.119, while leverage decreases from 0.616 to 0.566.

Table 2 displays the descriptive statistics of our key variables by ownership. With respect

5 The GTA database's full name is "China Non-listed Enterprise Database", collected by "GTA Information Technology Company", which covers 41 manufacturing industries and includes firms with annual sales over five million yuan (approximately US $650,000) from 1998-2009.The total number of firms is over two million, and 101 variables, including firms' basic information and financing information, are increased in this database. Because our main explanatory variable is denoted by accounts payable, which begins from 2004, our data sample's time period is 2004-2009.

6 In fact, our original panels cover 134,768 non-listed firms, corresponding to 935,623 firm-year observations during 1999-2007. As we identify five different types of firm ownerships: state, collective, legal person, domestic private, and foreign. "Collective firms are distinct from state-owned in that they are either owned by township-villages governments or collectively by the employees. Legal-person share is a mixture of ownership by state legal persons and private legal persons (Cull et al., 2009)". By the end of 1990s, nearly two-thirds of all TVEs had been privatized in the provinces, although considerable differences exist across townships as to the extent of privatization (Brandt et al., 2003; Brandt and Li, 2003). Therefore, we discuss three typical ownerships state, private and foreign in this paper, as the ownerships of collective and legal person are not clear and ambiguous.

Table 1 Summary Statistics by Year

VARIABLES	2000	2001	2002	2003	2004	2005	2006	2007
TFP^{LP}	3.588	3.602	3.719	3.846	4.057	4.296	4.525	4.795
	(100)	(100)	(104)	(107)	(113)	(120)	(126)	(134)
TFP^{OP}	1.677	1.693	1.722	1.766	1.797	1.826	1.854	1.881
	(100)	(101)	(103)	(105)	(107)	(109)	(111)	(112)
ROS	0.015	0.015	0.017	0.020	0.021	0.023	0.026	0.031
ROA	0.042	0.044	0.047	0.050	0.050	0.056	0.060	0.067
WK	0.036	0.045	0.049	0.052	0.054	0.064	0.075	0.084
WK (Positive)	0.126	0.134	0.137	0.140	0.140	0.146	0.154	0.158
WK (Negative)	-0.088	-0.088	-0.086	-0.086	-0.084	-0.081	-0.077	-0.073
Cash flow	0.080	0.083	0.087	0.091	0.093	0.104	0.110	0.119
Leverage	0.616	0.602	0.595	0.587	0.591	0.578	0.571	0.566
Sales growth	0.018	0.003	0.054	0.047	0.018	0.033	0.026	0.041
Size	9.939	9.870	9.860	9.861	9.984	10.094	10.204	10.331
Total assets	20723.011	19341.339	19148.889	19168.048	21676.847	24197.389	27011.014	30668.765
Age	2.268	2.168	2.170	2.115	2.160	2.265	2.360	2.440
Real age	9.660	8.741	8.758	8.290	8.671	9.631	10.591	11.473
SA	-3.095	-3.100	-3.102	-3.099	-3.087	-3.078	-3.067	-3.051
Observations	77,519	95,677	111,564	134,786	119,761	115,811	109,806	102,757

Note: See Appendix 1 for precise definitions of all variables. This table reports the summary statistics for the sample firms by year during 2000-2007. The variables of ROS, ROA, WK, Cash flow, and Leverage are ratios. The units of assets variables are thousand RMB, and the unit of Real age is year.

Table 2 Summary Statistics by Ownership

VARIABLES	Full Sample	SOEs	Private	Foreign	*Diff.*(S/P)	*Diff.*(P/F)	*Diff.*(F/S)
TFP^{LP}	4.026	3.653	3.952	4.304	-0.295***	0.352***	-1.117***
TFP^{OP}	1.772	1.700	1.776	1.806	-0.075***	0.030***	-0.154***
ROS	0.020	0.002	0.027	0.023	-0.025***	-0.005***	-0.020***
ROA	0.051	0.033	0.059	0.053	-0.025***	-0.006***	-0.016***
WK	0.056	0.013	0.048	0.110	-0.034***	0.062***	-0.129***
WK (Positive)	0.141	0.121	0.133	0.175	-0.012***	0.043***	-0.075***
WK (Negative)	-0.083	-0.104	-0.084	-0.064	-0.020***	0.020***	-0.052***
Cash flow	0.095	0.071	0.104	0.098	-0.033***	-0.006***	-0.024***
Leverage	0.590	0.647	0.594	0.544	0.052***	-0.050***	0.151***
Sales growth	0.031	-0.024	0.052	0.031	-0.076***	-0.029***	-0.058***
Size	10.011	10. 407	9.847	10.190	0.210***	0.344***	-0.456***
Age	2.239	2.707	2.108	2.251	0.599***	0.143***	0.638***
SA	-3.085	-3.038	-3.105	-3.063	0.010***	0.042***	-0.090***
Observations	890,987	106,038	554,669	170,280			

Note: See Appendix 1 for precise definitions of all variables. This table reports the summary statistics for the sample firms during 1999–2007 and tests comparing SOEs and private firms, private and foreign firms, SOEs and foreign firms. The variables of ROS, ROA, WK, Cash flow, and Leverage are ratio. The units of assets variables are thousand RMB. The significance of test statistic for the equality of variables' mean are shown by ***, ** and *. ***, ** and * represent statistical significance at the 1%, 5% and 10% percent level respectively.

to productivity, the average value for firms with different ownership types generally fluctuates around 4.0, the foreign group has the highest TFP (4.304) while the SOEs group has the lowest (3.653). Regarding profitability, ROS of the private group is the highest (0.027) while that of SOEs is only as low as 0.002. This echoes the fact that in China SOEs generally have lower efficiency and profitability compared to firms with other types of ownership[7]. Turning to the financial variables, net working capital of the foreign group is the highest (0.110) while that of SOEs is the lowest (0.013). In addition, we find that generally the positive working capital fluctuates around 0.141 whereas the negative working capital accounts for about −0.083. Consistent with the previous results, in terms of both positive and negative working capital, the SOEs group is the lowest (0.121 and −0.104 respectively) while the foreign group is the highest (0.175 and −0.064 respectively). Leverage of the foreign group is the lowest (0.544) while that of SOEs is the highest (0.647). This is highly consistent with the reality that in China SOEs can easily get access to loans and other debts from banks and other financial institutions while foreign firms may rely more on their own country's capital market rather than debt financing. Additionally, turning to the financial constraints proxies, cash flow, firm size and SA index, the SOE group is of the weakest financial constraints (0.071, 10.407 and −3.085) while the private group is of the strongest (0.104, 9.847 and −3.105). These three proxies are consistent with one another.

Table 3 shows the correlation coefficients of the key variables used in NWK regressions. All the correlation coefficients are smaller than 0.6 and most of them are very small, which can alleviate the concern of multi collinearity problem when they are used simultaneously in the same regression.

Table 3 Correlation Matrix between Independent Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) WK (Positive)	1						
(2) WK (Negative)	0.438	1					
(3) Cash flow	0.205	0.149	1				
(4) Leverage	-0.578	-0.519	-0.304				
(5) Sales growth	0.002	0.049	0.177	-0.033	1		
(6) Size	-0.089	-0.002	-0.129	0.021	0.042	1	
(7) Age	-0.033	-0.054	-0.106	0.101	-0.086	0.124	1

Note: See Appendix 1 for precise definitions of all variables. This table reports the correlation matrix between independent variables of the sample firms during 1999-2007.

Table 4 shows the descriptive statistics of the variables used in the estimation related to trade credit. We present the statistics for all samples of state, collectively, privately and foreign-owned firms. As expected, the TFP varies considerably across ownership groups. Specifically, foreign firms display the highest

7 Our results are consistent with previous studies (e.g., Chen and Guariglia, 2013), foreign and private firms have higher TFP and profitability.

TFP (2.280), whereas SOEs display the lowest[8] (1.668). State-owned firms are the lowest in trade credit (0.098), whereas foreign firms are the highest (0.185). Furthermore, SOEs are the lowest in cash flow (0.028) and sales growth (0.177), the largest in size (11.023) and the oldest in age (3.012), whereas private firms are the highest in cash flow (0.110) and sales growth (0.284), the smallest in size (9.688) and the youngest in age[9] (1.847). Finally, from the SA index, we find that SOEs suffer the least from financial constraints (-2.938), and private firms suffer the most[10] (-3.117).

In summary, these summary statistics suggest that firms owned by different ownerships perform differently in terms of productivity, financial constraint levels and general financial health.

Table 4 Descriptive Statistics-Ownership

VARIABLES	All	State	Collective	Private	Foreign	*Diff.*(S/P)	*Diff.*(F/P)	*Diff.*(C/P)	*Diff.*(F/S)	*Diff.*(C/S)	*Diff.*(C/F)
TFP^{op}	2.227	1.668	2.230	2.238	2.280	0.000	0.000	0.089	0.000	0.000	0.000
TFP^{fe}	3.364	2.685	3.378	3.344	3.500	0.000	0.000	0.000	0.000	0.000	0.000
Trade Credit	0.152	0.098	0.146	0.143	0.185	0.000	0.000	0.000	0.000	0.000	0.000
Cash Flow	0.093	0.028	0.084	0.110	0.072	0.000	0.000	0.000	0.000	0.000	0.000
Debt	0.558	0.597	0.583	0.567	0.511	0.000	0.000	0.000	0.000	0.000	0.000
Sales Growth	0.251	0.177	0.248	0.284	0.191	0.000	0.000	0.000	0.000	0.000	0.000
Assets Growth	0.112	0.131	0.114	0.116	0.098	0.000	0.000	0.320	0.000	0.000	0.000
Size	10.004	11.023	10.098	9.688	10.501	0.000	0.000	0.000	0.000	0.000	0.000
Age	1.956	3.012	2.094	1.847	1.920	0.000	0.000	0.000	0.000	0.000	0.000
SA Index	-3.074	-2.938	-3.068	-3.117	-3.000	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	757423	28407	149565	403687	175764						

Note: See Appendix 1 for precise definitions of all variables. Trade Credit, Cash Flow, Debt, Sales Growth and Assets Growth are ratios. The units of assets variables are thousand RMB. *Diff.* is the p-value of the test statistic for the equality of variables' mean, where "S", "C", "P" and "F" stands for state, collective, private and foreign, respectively.

Table 5 reports the correlation coefficients of all the key independent variables used in trade credit regressions. All the coefficients are smaller than 0.4 and most of them are very small, which can alleviate the concern of multi collinearity problem when they are used simultaneously in the same regression.

8 This distribution is consistent with Chen and Guariglia, 2013.

9 This is consistent with Guariglia et al., 2011; Ding et al., 2013.

10 Our SA index confirms that Chinese firms face financial constraints, but state- and foreign-owned firms tend to face less severe ones (Chow and Fung, 1998; 2000; Chen et al., 2008; Héricourt and Poncet, 2009; Poncet et al., 2010; Guariglia et al., 2011; Cull et al., 2015).

Table 5 Correlation Matrix between Independent Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)Trace Credit	1						
(2)Cash Flow	-0.129	1					
(3)Total Debt	0.350	-0.278	1				
(4)Assets Growth	-0.019	-0.067	0.041	1			
(5)Sales Growth	-0.018	0.192	-0.027	0.285	1		
(6)Size	-0.057	-0.153	0.026	0.186	-0.031	1	
(7)Age	-0.041	-0.065	0.014	-0.084	-0.175	0.188	1

Note: See Appendix 1 for precise definitions of all variables.

5. Estimation results

5.1 Regression results-NWK

Table 6 presents the results of system GMM to investigate the relationship between WK and TFP using Eq. (1) by ownerships. Each column with WK^2 tests the effect of the square term of WK on TFP to investigate the curvilinear relationship between WK and TFP. The results of private and foreign firms of the WK^2 model show a significant inverted U-shaped relationship between WK and TFP/ROS (columns 2-3), while SOEs do not (column). Further, the positive and negative WK groups are also examined separately to identify the unique relationship patterns of the two groups. As presented in Table 6, for the positive WK group the coefficients of TFP on WK for private and foreign firms are significantly negative (columns 5-6); in contrast, the coefficients of TFP on WK for private and foreign firms are significantly positive for the negative WK group (columns 5-6), while SOEs are not significantly (column 4). Table 6 indicates that relationship between WK and TFP is an inverted-U shaped with optimal working capital levels in private and foreign firms, but not in SOEs. Particularly, positive (negative) WK plays a significantly negative (positive) role on TFP in private and foreign firms, but not in SOEs, indicating that firms can boost their productivity by increasing working capital efficiency for private and foreign firms, i.e., minimizing receivable and inventory or maximizing payable when WK is positive, or maximizing receivable and inventory or minimizing payable when WK is negative. However, WK is not an efficient tool to enhance the firm performance in SOEs.

Table 6 Regression results-NWK

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: TFP			Dependent variable: TFP		
VARIABLES	SOEs	Private	Foreign	SOEs	Private	Foreign
Dependent $_{i,\,t-1}$	0.902***	0.958***	0.920***	0.916***	0.951***	0.898***
	(0.064)	(0.017)	(0.063)	(0.065)	(0.018)	(0.063)
WK (WK×D)	0.059	0.061***	0.238***	-0.405	-0.772***	-0.529**
	(0.382)	(0.022)	(0.074)	(0.361)	(0.098)	(0.263)
WK^2 (WK×1-D)	-0.135	-0.206***	-0.223***	0.221	0.563***	0.241***
	(0.137)	(0.058)	(0.082)	(0.138)	(0.038)	(0.046)
Cash flow	0.575	1.215***	2.480***	0.347	1.403***	1.285***
	(0.893)	(0.092)	(0.316)	(0.916)	(0.096)	(0.182)
Leverage	0.037	0.290***	0.452***	-0.077	0.154***	0.037
	(0.232)	(0.111)	(0.074)	(0.258)	(0.037)	(0.128)
Sales growth	0.288*	0.501***	0.142	0.278*	0.355***	1.505***
	(0.153)	(0.083)	(0.291)	(0.160)	(0.093)	(0.065)
Size	0.135	0.111***	0.131	0.109	0.106***	0.165
	(0.109)	(0.026)	(0.124)	(0.109)	(0.028)	(0.125)
Age	-0.038***	-0.041***	-0.118***	-0.043***	-0.041***	-0.021
	(0.013)	(0.005)	(0.026)	(0.012)	(0.005)	(0.017)
Constant	-0.830	-0.934***	-0.990	-0.329	-0.633***	-1.074
	(0.915)	(0.199)	(1.057)	(0.963)	(0.225)	(1.095)
Year Dummy	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES
M(2)				0.404	0.080	0.365
M(3)	0.433	0.074	0.332	0.221	0.106	0.278
Hansen (*J*) Test	0.169	0.120	0.084	0.069	0.000	0.003
Observations	64,249	438,282	130,778	63,659	432,579	129,380

Note: See Appendix 1 for precise definitions of all variables. This table presents the results from regressions using two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (*J*) statistics is test of overidentifying restrictions, distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, ** and * represent statistical significance at the 1%, 5% and 10% percent level respectively.

5.2 Regression results-Trade credit

The estimation results of Eq. (2) are presented in columns 1-5 in Table 7. According to column 1, we obtain the estimations of our full data sample and find that size is positively and significantly associated with TFP, whereas age exhibits a negative and significant result. Notably, trade credit, our main explanatory variable of interest, is a positive and significant contributing factor to productivity, revealing

that trade credit is an efficient financial intermediation for firm productivity[11].

We further find that trade credit has a positive effect on productivity, which is significant in collective, private and foreign firms but insignificant in state-owned enterprises. Cash flow has the most significant effect (under 1%) on firm productivity in private firms, indicating that private firms rely more on internal finance and are more financially constrained (Poncet et al., 2010; Guariglia et al., 2011; Ding et al., 2013; Chen et al., 2013). Therefore, trade credit is an efficient supplement informal financial tool in Chinese private firms (column 4). Because SOEs can obtain access to formal financial sources easily and benefit from soft budget constraints from formal financing, such as banks (Ding et al., 2013), particularly state-owned banks, which typically discriminate other types of ownership (Allen et al., 2005), trade credit is not a significant indicator of state-owned firms, and Cull et al. (2015) also find trade credit is not sensitive to state-owned enterprises' investment behavior. The significance derives from the similar properties of collectively and privately owned firms (Abraham et al., 2010). According to World Bank (2005), fully foreign-owned firms in China have limited access to domestic direct finance, although foreign firms suffer less from financial constraints than privately and collectively owned firms do. As indicated in column 5, which shows that trade credit positively and significantly affects firm productivity, trade credit is a useful financial tool when foreign firms' direct domestic finance is blocked.

11 This result can support some previous studies by illustrating trade credit is an efficient financial tool in China, such as Brandt and Li, 2003; Ge and Qiu, 2007; Lin and Chou, 2015.

Table 7 Regression Results with Trade Credit

	(1)	(2)	(3)	(4)	(5)
VARIABLES	All	State	Collective	Private	Foreign
L.TFP^{op}	0.848***	0.962***	0.901***	0.845***	0.870***
	(0.012)	(0.081)	(0.024)	(0.015)	(0.033)
Trade Credit	0.234***	0.124	0.212***	0.249***	0.200**
	(0.028)	(0.436)	(0.036)	(0.034)	(0.102)
Cash Flow	1.247***	0.490	1.042***	1.298***	1.203
	(0.161)	(1.241)	(0.099)	(0.196)	(1.145)
Debt	0.282***	0.066	0.258***	0.274***	0.369*
	(0.037)	(0.361)	(0.019)	(0.012)	(0.202)
Assets Growth	-1.020***	-0.427***	-0.554***	-0.704***	-1.247
	(0.383)	(0.135)	(0.014)	(0.087)	(1.205)
Sales Growth	1.096***	2.295**	1.156***	1.059***	1.181
	(0.255)	(1.132)	(0.019)	(0.205)	(1.274)
Size	0.146***	0.085	0.045***	0.172***	0.051
	(0.014)	(0.098)	(0.008)	(0.024)	(0.152)
Age	0.008	-0.117	-0.004	0.013	-0.006
	(0.040)	(0.276)	(0.026)	(0.024)	(0.126)
Constant	-1.552***	0.800	-0.655***	-1.833***	-0.103
	(0.241)	(2.546)	(0.058)	(0.163)	(1.445)
Year Dummy	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes
m(2)		0.769			
m(3)	0.070		0.935	0.244	0.122
Hansen Test	0.094	0.565	0.101	0.453	0.674
Observations	541,546	16,765	105,638	292,399	125,122

Note: See Appendix 1 for precise definitions of all variables. This table presents the results from regressions using two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. Hansen statistics is test of overidentifying restrictions, distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, ** and * represent statistical significance at the 1%, 5% and 10% percent level respectively.

6. Summary

We used the data of Chinese non-listed firms over the period of 1999-2007 to study the relationship between working capital and firm performance. Moving beyond the existing literature, we investigated that how working capital management impacts on firm TFP. We found that there is an inverted U-shaped relationship between working capital and TFP. If a firm's working capital is positive (negative), the firm's working capital will have a negative (positive) influence on its TFP. Working capital is significantly associated with TFP in privately

and foreign owned firms, while not being significantly associated with TFP in SOEs. It shows that working capital management is an efficient tool to enhance firm performance of non-SOEs.

Furthermore, this paper also investigated the relationship between trade credit and TFP for Chinese non-listed manufacturing firms. By employing a large and representative firm-level dataset, we empirically examined that whether working capital and trade credit as non-standard financial intermediations affect firm TFP or not. Our empirical findings suggest that Chinese firms face strong financial constraints, which strangle their productivity. Chinese firms' productivity is significantly and positively affected by trade credit. In particular, as SOEs tend to have better access to external finance, trade credit has an insignificant effect on the productivity of state-owned enterprises. However, trade credit is found to have a significant effect on the productivity of collectively, privately and foreign-owned firms.

China is the largest transitional and developing economy, regarding to the underdeveloped financial system and financial depression policy. Informal finance is an efficient and important financial tunnel to help with Chinese firms' growth in the future. Informal finance will still work in China, and we need to pay attention to their development in the "New Normal" background.

Appendix 1. Variable Name Definition

TFP^{op}	Total Factor Productivity by Olley and Pakes (1996)
TFP^{fe}	Total Factor Productivity by fixed effect method
Working Capital	Current assets minus current liabilities divided by total assets
NWK	Difference between working capital Year t-2 to Year t-1 divided by total assets
Trade Credit	Account of Payable Divided by Total Assets
Cash Flow	Net Profit plus Depreciation Divided by Total Assets
Debt	Long Term and Short Term Debt Excludes Account of Payable Divided by Total Assets
Assets Growth	Proportion of Change in Assets from Year t-2 to Year t-1
Sales Growth	Proportion of Change in Sales from Year t-2 to Year t-1
Firm Size	Natural Logarithm of Total Assets
Firm Age	Natural Logarithm of the Number of Years since the Open Year
SA Index	-0.737*Size+0.043*Size2-0.040*Age

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Firm Growth in China: A Perspective of Informal Financing

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China has experienced continuously spectacular economic growth, at an average rate of nearly 10% over the past decades. While in the first quarter of 2016, the GDP growth rate has declined to 6.7%. As the largest developing and transitional economy with many years of uninterrupted fast growth, China's financial system is underdeveloped, and the legal protection environment is weak. There are no consensus results to explain this Chinese growth puzzle. Under the "New Normal" policy background, firm's growth is focused on, this paper tries to discuss and answer this puzzle from the informal financing perspective. I investigate the relationships between TFP and net working capital, TFP and trade credit, and support a micro-level evidence that Chinese firms' TFP is significantly related to informal financing, particularly the non-state factors, but not state-owned enterprises.