Capital structure and financial performance in China's agricultural sector: a panel data analysis

Reception of originals: 02/03/2021
Release for publication: 07/17/2021

Jian Xu
PhD in Accounting
Institution: School of Management, Qingdao Agricultural University
Address: No. 700 Changcheng Road, Chengyang District, 266109, Qingdao, China
E-mail: xujiansword@163.com

Zhiliang Sun
Associate Professor
Institution: School of Management, Qingdao Agricultural University
Address: No. 700 Changcheng Road, Chengyang District, 266109, Qingdao, China
E-mail: sz701009@163.com
(Corresponding author)

Yue Shang
Lecturer in Business College
Institution: Business College, Yantai Nanshan University
Address: No. 12 Daxue Road, Donghai Tourism Resort, 265713, Yantai, China
E-mail: shangyue59@163.com

Abstract

The objective of this paper is to investigate the role of capital structure in financial performance of Chinese agricultural listed companies from 2013 to 2019. This paper also explores whether company ownership and location influence this relationship. Financial performance is measured by return on assets (ROA) and return on equity (ROE), and the ratios of total debt, short-term debt, and long-term debt are used to measure capital structure. The panel regression estimation technique is applied for analysis purpose. The empirical results reveal that total debt ratio and short-term debt ratio have a negative impact on financial performance of Chinese agricultural listed companies, while long-term debt ratio has no significant impact on ROA and ROE. In addition, the impact of capital structure on financial performance in private-owned companies is higher than that in state-owned companies. The degree of negative impact of total debt on financial performance is higher for companies in central and western regions compared to companies in eastern region. The findings might provide some new insights for corporate managers to optimize capital structure and induce financial performance in emerging markets.

Keywords: Capital structure. Financial Performance. Agricultural listed companies

1. Introduction

Capital structure is related to a firm's financing activities by using various sources of funds. Capital structure decision as a management choice will directly influence a firm's financial performance because of its association with risk and return (Lin and Jia, 2009; Norvaisiene, 2012; Bandyopadhyay and Barua, 2016; Pinto and Quadras, 2016; Le and Phan, 2017; Mohammad and Bujang, 2020; Ullah *et al*., 2020). If a company depends more on borrowed funds, it will face greater risk, which in turn reduces corporate profitability. Optimal capital structure is expected to produce the lowest cost of capital and maximize firm value (Widyaningrim, 2015). Therefore, more emphasis must be put when capital structure decision is made.

Three basic theories are related to the selection of firms' capital structure. Modigliani and Miller (M&M) theory proposed that capital structure is irrelevant to firm value without corporate income tax (Modigliani and Miller, 1958). Subsequently, when taking corporate income tax into account, Modigliani and Miller (1963) concluded that an increase in financial leverage will enhance firm value. To counter M&M theory, the trade-off theory was developed. This theory suggested that an optimal capital structure reflects a trade-off between the benefit of tax and the cost of bankruptcy. Pecking order theory explains financing decisions of corporate managers. It pointed out that capital structure decision is based on the priority of capital. Companies generally first use internal capital (e.g. internal funds and retained earnings), followed by debt and equity capital.

China's agricultural listed companies play a pivotal role in the realization of agricultural industrialization (Xu and Wang, 2019; Xie *et al*., 2019; Jiang *et al*., 2020). Their shares of stock are very small in the imperfect capital market (Lin and Jia, 2009). These companies have been seeking transformation and upgrading because they face many problems such as limited external resources and insufficient innovative input. Agricultural listed companies can achieve their sustainable development by using capital operation strategy, and the financing pattern of them is not clearly understood. Therefore, studying the impact of capital structure on financial performance in China's agricultural sector has great practical significance as debt becomes a burden during the COVID-19 crisis.

This paper focuses on the impact of capital structure on financial performance of agricultural listed companies in the Chinese context. Capital structure ratios (i.e. total debt ratio, short-term debt ratio, and long-term debt ratio) are used as proxies for capital structure, and return on assets (ROA) and return on equity (ROE) are used to measure financial performance. In addition, we also examine whether company ownership and location affect the impact of capital structure on financial performance.

The contributions of this paper are as follows. First, few studies have investigated the relationship between capital structure and financial performance in China's agricultural sector, and this paper attempts to fill this gap. Second, we enrich the extant literature by examining whether company ownership and location influence the relationship between capital structure and firms' financial performance. Finally, this paper might provide some new insights for corporate capital operation, capital structure optimization, and governance structure improvement.

The paper is organized as follows. Section 2 presents the literature review and develops the research hypotheses. Research methodology is presented in Section 3, and empirical results are shown in Section 4. Finally, Section 5 concludes the paper.

2. Literature Review and Hypotheses Development

The relationship between capital structure and financial performance has attracted many scholars' attention in the corporate governance, but the conclusions are not consistent. Some studies suggest that capital structure is positively related to financial performance. For example, Bi and Chen (2006) argued that agricultural listed companies with higher debt ratio tend to have higher ROA, ROE, and profit margin. In French, Margaritis and Psillaki (2010) reported a significant progressive relationship between debt and firm performance. The findings of Goyal (2013) showed a positive relationship between short-term debt and Indian banking performance in terms of ROA, ROE, and earnings per share. Park and Jang (2013) found that debt is an efficient way to enhance firm performance in the restaurant industry. Similar results were also obtained by Musah (2017), Dinh and Pham (2020), Parvin *et al*. (2020), and Wei *et al*. (2020).

On the contrary, a large body of studies documents a negative relationship between capital structure and financial performance. The relationship between the levels of debt in capital structure and firm performance was analyzed by Majumdar and Chhibber (1999), and their findings described a negative relationship between the two. According to Bistrova *et al*. (2011), high levels of debt are detrimental to corporate profitability of Baltic companies. Olokoyo (2013) expressed the relationship between capital structure and financial performance in Nigeria by using regression analysis. They found that highly-leveraged firms are more likely to have lower performance. Subsequently, debt issues on the balance sheet become the cause of decreased performance of non-financial firms in Spain (Lious *et al*., 2016). Pinto and Quadras (2016) studied the impact of capital structure on financial performance of 21 Indian banks. Results of the analysis revealed a negative relationship between them. Le and Phan (2017), analyzing how capital structure affects firm performance of non-financial firms in Vietnam, found that debt ratio increases by 1%, ROA and ROE will fall about 0.1% and 0.2%, respectively. Siddik *et al*. (2017) and Özcan (2019) reported that firms that use more debt tend to decrease financial performance. Nenu *et al*. (2018) conducted a thorough research that indicated that the relationship between short-term and long-term debt ratio and firm profitability is negative. A recent study by Ali and Faisal (2020) found that financial performance is decidedly influenced by capital structure indicator due to underutilization of resources.

However, Phillips and Sipahioglu (2004) researched on the impact of capital structure on hotel financial performance and their findings suggested a non-significant relationship. Ullah *et al*. (2020) also concluded that total debt to total assets ratio has an insignificant connection with financial performance (measured by ROE) in the textile sector of Pakistan. Based on the above arguments, we come to the following hypotheses:

H1: Total debt ratio has a negative impact on financial performance of agricultural listed companies.

H2: Short-term debt ratio has a negative impact on financial performance of agricultural listed companies.

H3: Long-term debt ratio has a negative impact on financial performance of agricultural listed companies.

3. Methodology

3.1. Sample selection

The original sample consists of agricultural companies listed on the Shanghai and Shenzhen stock exchanges over the seven-year period (2013-2019). Companies with missing information, companies issuing other kinds of shares, and special treatment (ST) companies are excluded from our sample. Finally, we obtain 39 agricultural listed companies with 247 firm-year observations. Data are sourced from the China Stock Market & Accounting Research (CSMAR) database. The regressions are carried out using Stata 14.

3.2. Variables

(1) Dependent variables. Following Arcas and Bachiller (2008), Bistrova *et al*. (2011), Norvaisiene (2012), Goyal (2013), Knežević *et al*. (2017), Musah (2017), Siddik *et al*. (2017), Ahmed *et al*. (2018), Özcan (2019), Xu and Wang (2019), Zimmer *et al*. (2019), Ahmed and

Bhuyan (2020), Ali and Faisal (2020), Mardones and Cuneo (2020), Mohammad and Bujang (2020), Nguyen and Nguyen (2020), Wassie (2020), and Xu and Li (2020), ROA and ROE are used to measure firms' financial performance. ROA measures the efficiency of asset utilization to generate profits (Parvin *et al*., 2020). ROE demonstrates a company's ability to generate profits from shareholders' equity (Ullah *et al*., 2020).

(2) Independent variables. Consistent with Goyal (2013), Musah (2017), Siddik *et al*. (2017), Nenu *et al*. (2018), Özcan (2019), Mohammad and Bujang (2020), Nguyen and Nguyen (2020), and Wassie (2020), capital structure is measured with three ratios, namely, total debt ratio (LEV), short-term debt ratio (SLEV), and long-term debt ratio (LLEV).

(3) Control variables. Guided by Majumdar and Chhibber (1999), Margaritis and Psillaki (2010), Bandyopadhyay and Barua (2016), Lious *et al*. (2016), Mursalim *et al*. (2017), Siddik *et al*. (2017), Nenu *et al*. (2018), Özcan (2019), Ramli *et al*. (2019), Ahmed and Bhuyan (2020), Dinh and Pham (2020), Mardones and Cuneo (2020), Nguyen and Nguyen (2020), and Spitsin *et al*. (2020), firm size (SIZE), sales growth rate (SALES), tangibility (FIX), liquidity (CR), and gross domestic product growth rate (GDP) are chosen as control variables. In addition, a year dummy (YEAR) is included to control for changes in the economic environment.

Table 1 shows the definition of all variables used in this study.

Table 1: Variable definition

Variable	Symbol	Measurement
Return on assets	ROA	Net income/average total assets
Return on equity	ROE	Net income/average shareholders' equity
Total debt ratio	LEV	Total liabilities/total assets
Short-term debt ratio	SLEV	Short-term liabilities/total assets
Long-term debt ratio	LLEV	Long-term liabilities/total assets
Firm size	SIZE	Natural logarithm of total assets
Sales growth rate	SALES	(Current year's sales-last year's sales)-1
Tangibility	FIX	Fixed assets/total assets
Liquidity	CR	Current assets/current liabilities
Gross domestic product growth rate	GDP	Growth rate of gross domestic product
Year dummy	YEAR	Dummy variable that takes 1 for the test year, 0 otherwise

Source: Authors' illustration

3.3. Model specification

Models (1) and (2) are used to explore the relationship between total debt ratio and financial performance.

$$ROA_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALES_{i,t} + \beta_4 FIX_{i,t} + \beta_5 CR_{i,t} + \beta_6 GDP_{i,t} + \sum YEAR + \varepsilon_{i,t} \quad (1)$$

$$ROE_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALES_{i,t} + \beta_4 FIX_{i,t} + \beta_5 CR_{i,t} + \beta_6 GDP_{i,t} + \sum YEAR + \varepsilon_{i,t} \quad (2)$$

Models (3) and (4) aim to test H2.

$$ROA_{i,t} = \beta_0 + \beta_1 SLEV_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALES_{i,t} + \beta_4 FIX_{i,t} + \beta_5 CR_{i,t} + \beta_6 GDP_{i,t} + \sum YEAR + \varepsilon_{i,t} \quad (3)$$

$$ROE_{i,t} = \beta_0 + \beta_1 SLEV_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALES_{i,t} + \beta_4 FIX_{i,t} + \beta_5 CR_{i,t} + \beta_6 GDP_{i,t} + \sum YEAR + \varepsilon_{i,t} \quad (4)$$

Models (5) and (6) are employed to test H3.

$$ROA_{i,t} = \beta_0 + \beta_1 LLEV_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALES_{i,t} + \beta_4 FIX_{i,t} + \beta_5 CR_{i,t} + \beta_6 GDP_{i,t} + \sum YEAR + \varepsilon_{i,t} \quad (5)$$

$$ROE_{i,t} = \beta_0 + \beta_1 LLEV_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALES_{i,t} + \beta_4 FIX_{i,t} + \beta_5 CR_{i,t} + \beta_6 GDP_{i,t} + \sum YEAR + \varepsilon_{i,t} \quad (6)$$

where i is the firm; t represents the year; β stands for the presumed parameter; ε denotes the disturbance.

4. Results

4.1. Descriptive statistics

Descriptive statistics are shown in Table 2. The mean values of ROA and ROE indicate that agricultural listed companies have relatively low profitability. It is clear from Table 2 that debt ratio stands at 41.35% on an average for agricultural listed companies, consistent with Zhang and Ren (2009) who pointed out that the asset-liability ratio of these companies generally lies between 40% and 50%. The mean of SLEV is 14.12%, and long-term debt ratio is 4.53%, indicating that agricultural listed companies rely more on short-term debt than long-term debt. In addition, the mean value of SIZE is 21.8372. Agricultural companies have a higher rate of growth in sales with a mean of 0.1171. The share of fixed assets in the asset structure is on average 26.87%. The average CR is 2.5802, indicating that agricultural listed companies do not have capital flow problems.

Table 2: Descriptive statistics

Variable	N	Mean	Max	Min	Standard Deviation
ROA	247	0.0181	0.6754	-1.8591	0.1568
ROE	247	-0.0066	0.8360	-6.8500	0.4883
LEV	247	0.4135	0.9801	0.0496	0.1932
SLEV	247	0.1412	0.6975	0	0.1275
LLEV	247	0.0453	0.4170	0	0.0770
SIZE	247	21.8372	24.9065	19.4777	0.9819
SALES	247	0.1171	2.4844	-0.6192	0.3792
FIX	247	0.2687	0.6948	0.0110	0.1541
CR	247	2.5802	28.1765	0.1541	3.5414
GDP	247	0.0685	0.076	0.061	0.0045

Source: Authors' calculation

Table 3 shows that ROA and ROE fluctuate greatly during the observed period. In

2015, China's supply-side structural reform was taken to eliminate excess capacity and reduce leverage, which led to a decrease in firms' financial performance. LEV was high in 2015, reaching 43%. However, it decreased to 38.83% in 2019. SLEV has a declining trend, while LLEV does not show much variation during the sample period.

Table 3: Year-wise means for firms' capital structure and financial performance

Variable (Mean)	2013	2014	2015	2016	2017	2018	2019
ROA	0.0183	0.0146	-0.0118	0.0415	0.0153	-0.0147	0.0601
ROE	0.0199	0.0158	-0.0344	0.0527	0.0033	-0.1406	0.0437
LEV	0.4080	0.4189	0.4300	0.4087	0.4215	0.4207	0.3883
SLEV	0.1694	0.1642	0.1644	0.1222	0.1289	0.1259	0.1226
LLEV	0.0394	0.0414	0.0532	0.0539	0.0523	0.0413	0.0356

Source: Authors' calculation

4.2. Correlation analysis

Table 4 presents the results of correlation analysis. ROA and ROE are negatively correlated with LEV and SLEV, while they do not have significant correlation with LLEV. We compute the variance inflation factors (VIFs) and find all values to be less than 10, which suggests that there exists no serious multi-collinearity.

Table 4: Correlation analysis

Variable	1	2	3	4	5	6	7	8	9	10
1 ROA	1									
2 ROE	0.929***	1								
3 LEV	-0.333***	-0.324***	1							
4 SLEV	-0.272***	-0.250***	0.744***	1						
5 LLEV	-0.044	-0.026	0.424***	0.107*	1					
6 SIZE	0.183***	0.111*	0.209***	0.133**	0.086	1				
7 SALES	0.288***	0.212***	0.018	-0.002	0.004	0.102	1			
8 FIX	0.033	0.018	0.196***	0.315***	-0.092	0.175***	0.101	1		
9 CR	0.054	0.066	-0.530***	-0.417***	-0.064	-0.417***	-0.063	-0.336***	1	
10 GDP	-0.064	0.009	0.031	0.129**	0.011	-0.167***	-0.095	-0.019	0.006	1

*, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.
Source: Authors' calculation

4.3. Regression results

Table 5 shows the regression results of full sample. Based on the Hausman test, the fixed effect (FE) model is used in Model (1), and the random effect (RE) model is applied in Models (2)-(6). The coefficients of LEV in Models (1) and (2) are negative and significant at the 1% level, which fully supports H1. This may imply that the use of debt is expensive, and thus reduces financial performance. Taking 11 agricultural firms as the sample, Chen (2009) also observed a negative relationship between LEV and comprehensive financial performance. However, based on factor analysis, Li (2020) concluded that debt ratio has a negative but insignificant impact on operating performance in China's agricultural sector. Likewise, SLEV has a negative and statistically significant impact on two financial performance indicators. The reason may be the high cost of borrowing in developing countries compared with developed countries. Therefore, H2 is accepted. The coefficients of LLEV in Models (5) and (6) are negative, but not significant at the 5% level, which leads to the rejection of H3. The results suggest that debt risk in agricultural sector might come mainly from the use of short-term debt rather than long-term debt. However, Mohammad and Bujang (2020) recorded a strong negative association between LLEV and financial performance of plantation firms in Malaysia.

In China's agricultural sector, the concept of capital structure can be explained by pecking order theory. In addition, SIZE and SALES have a significantly positive impact on financial performance. Using a sample of 29 airport firms over the 1989-2017 period, Özcan (2019) observed a positive relationship between SIZE and firm performance while a non-significant relationship between SALES and firm performance. Siddik *et al*. (2017) pointed out that an increase in sales growth will lead to better bank performance. FIX, CR, and GDP have no significant impact on both ROA and ROE. Spitsin *et al*. (2020), analyzing high-tech firms in Russia, found that FIX negatively affect firms' ROA. Majumdar and Chhibber (1999) suggested that Indian firms are able to effectively manage working capital and gain profit. Bandyopadhyay and Barua (2016) found that macroeconomic cycle significantly affects corporate capital structure choice and hence performance. Ramli *et al*. (2019) revealed that higher economic growth tends to increase profit levels.

Table 5: Regression results of full sample

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
	ROA	ROE	ROA	ROE	ROA	ROE
	FE	RE	RE	RE	RE	RE
Constant	0.207 (0.24)	-1.560 (-1.61)	-0.738** (-2.37)	-2.033** (-2.07)	-0.734** (-2.24)	-1.975* (-1.90)
LEV	-0.612*** (-6.79)	-1.056*** (-5.77)				
SLEV			-0.405*** (-4.70)	-1.146*** (-4.23)		
LLEV					-0.107 (-0.79)	-0.193 (-0.45)
SIZE	0.004 (0.10)	0.077** (2.20)	0.035*** (3.09)	0.077** (2.20)	0.037*** (3.06)	0.079** (2.12)
SALES	0.124*** (5.10)	0.262*** (3.37)	0.109*** (4.43)	0.253*** (3.15)	0.114*** (4.44)	0.269*** (3.24)
FIX	0.068	0.122	0.096	0.272	0.024	0.081

	(0.41)	(0.58)	(1.37)	(1.26)	(0.33)	(0.35)
CR	-0.003 (-0.40)	-0.009 (-0.80)	0.003 (0.80)	0.006 (0.61)	0.008** (2.32)	0.021** (1.99)
GDP	-0.446 (-0.19)	4.361 (0.61)	0.432 (0.19)	6.359 (0.86)	-0.872 (-0.37)	2.561 (0.34)
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
N	247	247	247	247	247	247
R^2	0.3157	0.1968	0.2204	0.1512	0.1473	0.0868
F (Wald)	8.26***	58.35***	65.78***	41.45***	40.63***	22.20**
Hausman test	Prob > chi2 = 0.0277	Prob > chi2 = 0.0507	Prob > chi2 = 0.4160	Prob > chi2 = 0.4420	Prob > chi2 = 0.2863	Prob > chi2 = 0.4229

*, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. T-statistics are in the parenthesis.
Source: Authors' calculation

4.4. Additional analyses

Stated-owned enterprises (SOEs) and private-owned enterprises (POEs) co-exist in the Chinese market economy (Jin *et al.*, 2018). We split our sample into SOEs and POEs by company ownership. As is shown in Table 10, on average, POEs are more profitable and less leveraged than SOEs, consistent with Megginson *et al*. (1994) who asserted that an increase in sales and a decrease in debt levels after SOEs are privatized, Tian (2001) who found that Chinese POEs perform significantly better than SOEs, and Le and Phan (2017) who suggested SOEs generally have a higher debt ratio than POEs with lower returns in Vietnam. There are significant differences in LEV and LLEV for the two types of agricultural companies.

Tables 6 and 7 show the regression results of SOEs and POEs, respectively. In SOEs, LEV and SLEV significantly and negatively affect financial performance. LLEV has a negative impact on only the ROE indicator.

Table 6: Regression results of SOEs

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
	ROA	ROE	ROA	ROE	ROA	ROE
	RE	RE	RE	RE	RE	RE
Constant	-0.257 (-0.96)	-0.538 (-0.67)	-0.386 (-1.53)	-0.871 (-1.18)	-0.283 (-0.92)	-0.616 (-0.64)
LEV	-0.186*** (-4.29)	-0.669*** (-5.21)				
SLEV			-0.239*** (-4.11)	-0.983*** (-5.85)		
LLEV					-0.137 (-1.32)	-0.666** (-2.12)
SIZE	0.012 (1.10)	0.018 (0.56)	0.015 (1.45)	0.023 (0.77)	0.009 (0.75)	0.009 (0.24)
SALES	0.004 (0.21)	0.039 (0.67)	0.001 (0.07)	0.027 (0.48)	0.003 (0.12)	0.034 (0.54)
FIX	-0.053 (-0.75)	-0.314 (-1.49)	-0.005 (-0.08)	-0.172 (-0.89)	-0.087 (-0.99)	-0.514* (-1.90)

CR	-0.002 (-0.99)	-0.011 (-1.63)	-0.0004 (-0.17)	-0.006 (-0.98)	0.001 (0.54)	0.001 (0.09)
GDP	1.631 (1.14)	7.607* (1.93)	1.852 (1.26)	8.471** (2.16)	1.650 (1.09)	7.809* (1.85)
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
N	119	119	119	119	119	119
R^2	0.2215	0.2951	0.2220	0.3331	0.0656	0.0888
Wald	26.49***	35.42***	25.12***	42.68***	8.77*	11.91*
Hausman test	Prob > chi2 = 0.3328	Prob > chi2 = 0.8932	Prob > chi2 = 0.3369	Prob > chi2 = 0.6874	Prob > chi2 = 0.3131	Prob > chi2 = 0.9035

*, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. T-statistics are in the parenthesis.
Source: Authors' calculation

Similarly, in Table 7, there is a negative relationship between LEV and SLEV and firms' financial performance. LLEV has no impact on ROA and ROE. It is worth noticing that the impact of LEV and SLEV in POEs is greater than that in SOEs. This could be explained by the fact that SOEs are much easier to obtain more capital subsidies provided by the government due to their close connections with the government. Conversely, Nguyen and Nguyen (2020) found that the negative impact of capital structure is stronger in SOEs than that in non-SOEs in the case of Vietnam.

Table 7: Regression results of POEs

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
	ROA	ROE	ROA	ROE	ROA	ROE
	RE	RE	RE	RE	RE	RE
Constant	-0.674 (-1.32)	-1.930 (-1.16)	-0.818 (-1.43)	-2.331 (-1.30)	-0.771 (-1.31)	-2.105 (-1.14)
LEV	-0.700*** (-5.29)	-2.027*** (-4.56)				
SLEV			-0.572*** (-2.91)	-1.349** (-2.13)		
LLEV					-0.152 (-0.48)	0.063 (0.06)
SIZE	0.048*** (2.67)	0.112* (1.93)	0.035* (1.73)	0.077 (1.23)	0.037* (1.75)	0.076 (1.17)
SALES	0.156*** (4.34)	0.360*** (2.92)	0.164*** (4.26)	0.381*** (2.91)	0.173*** (4.36)	0.404*** (3.03)
FIX	0.092 (0.78)	0.336 (0.88)	0.248* (1.84)	0.732* (1.72)	0.168 (1.23)	0.517 (1.22)
CR	-0.017 (-1.18)	-0.057 (-1.16)	0.018 (1.32)	0.053 (1.20)	0.036*** (2.93)	0.098** (2.47)
GDP	-1.245 (-0.33)	3.791 (0.29)	0.403 (0.10)	7.071 (0.50)	-2.008 (-0.48)	0.960 (0.07)
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
N	128	128	128	128	128	128
R^2	0.3905	0.2890	0.2927	0.1922	0.2387	0.1590
Wald	75.70***	47.43***	50.81***	28.19***	39.53***	22.82**
Hausman test	Prob > chi2 = 0.6352	Prob > chi2 = 0.4591	Prob > chi2 = 0.6064	Prob > chi2 = 0.3791	Prob > chi2 = 0.3754	Prob > chi2 = 0.3018

*, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. T-statistics are in the parenthesis.

Source: Authors' calculation

Guided by Jin *et al*. (2018), we split the full sample into companies in eastern region and companies in central and western regions by company location. Table 11 demonstrates the means of the values under two different groups classified by location. There are great differences in only LLEV. It is worth noticeable that companies in central and western regions tend to have a higher level of leverage. Arcas and Bachiller (2008) confirmed that there are important differences in leverage and firm performance between European zones.

These regression results are presented in Tables 8 and 9. In eastern region, LEV and LLEV are found to have a negative impact on ROA and ROE, while the impact of LLEV is not significant.

Table 8: Regression results of companies in eastern region

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
	ROA	ROE	ROA	ROE	ROA	ROE
	FE	FE	FE	FE	RE	RE
Constant	-1.517 (-1.20)	-5.067** (-2.08)	-1.616 (-1.29)	-5.234** (-2.36)	-0.785** (-2.30)	-2.069** (-2.43)
LEV	-0.479*** (-4.56)	-1.316*** (-6.52)				
SLEV			-0.620*** (-4.87)	-1.891*** (-8.36)		
LLEV					-0.027 (-0.26)	-0.250 (-0.92)
SIZE	0.083 (1.60)	0.237** (2.37)	0.081 (1.58)	0.227** (2.50)	0.042*** (3.55)	0.082** (2.59)
SALES	0.092*** (4.05)	0.145*** (3.31)	0.084*** (3.70)	0.117*** (2.91)	0.126*** (5.30)	0.218*** (4.45)
FIX	-0.161 (-0.85)	-0.270 (-0.75)	-0.089 (-0.48)	-0.066 (-0.20)	0.138** (2.06)	0.217 (1.25)
CR	0.005 (0.58)	-0.023 (-1.31)	0.013 (1.60)	-0.006 (-0.42)	0.027*** (4.19)	0.054*** (3.64)
GDP	-1.006 (-0.39)	7.009 (1.43)	-0.668 (-0.27)	8.031 (1.80)	-3.060 (-1.29)	1.383 (0.28)
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
N	124	124	124	124	124	124
R^2	0.5149	0.5381	0.5271	0.6159	0.3956	0.3147
F (Wald)	8.98***	9.85***	9.42***	13.56***	73.30***	51.48***
Hausman test	Prob > chi2 = 0.0029	Prob > chi2 = 0.0471	Prob > chi2 = 0.0031	Prob > chi2 = 0.0203	Prob > chi2 = 0.0712	Prob > chi2 = 0.4978

** and *** indicate significance at the 5% and 1% level, respectively. T-statistics are in the parenthesis.
Source: Authors' calculation

Table 9 shows that the impact of LEV in central and western regions is greater than that in eastern region. SLEV negatively influences the ROE indicator. LLEV still has a non-significant impact on financial performance. Spitsin *et al*. (2020) suggested that for firms located in agglomerations the utilization of borrowed capital is more viable to maximize profitability compared with peripheral firms.

Table 9: Regression results of companies in central and western regions

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
	ROA	ROE	ROA	ROE	ROA	ROE
	FE	FE	FE	RE	FE	FE
Constant	0.616 (0.50)	1.677 (0.38)	1.332 (1.00)	-2.482 (-1.42)	1.868 (1.44)	6.114 (1.30)
LEV	-0.628*** (-4.16)	-2.184*** (-3.97)				
SLEV			-0.390 (-1.52)	-1.135** (-2.07)		
LLEV					-0.097 (-0.21)	0.115 (0.07)
SIZE	-0.022 (-0.42)	-0.058 (-0.31)	-0.066 (-1.21)	0.093 (1.49)	-0.087 (-1.63)	-0.291 (-1.50)
SALES	0.164*** (3.30)	0.574*** (3.17)	0.161*** (3.00)	0.316* (1.78)	0.168*** (3.03)	0.575*** (2.87)
FIX	0.226 (0.85)	1.249 (1.29)	0.175 (0.61)	-0.031 (-0.06)	0.119 (0.41)	0.899 (0.86)
CR	-0.009 (-0.93)	-0.033 (-0.91)	-0.002 (-0.21)	0.007 (0.44)	-0.0002 (-0.02)	0.000 (0.00)
GDP	1.736 (0.46)	5.288 (0.38)	1.972 (0.46)	9.285 (0.64)	0.073 (0.02)	-0.958 (-0.06)
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
N	123	123	123	123	123	123
R^2	0.3041	0.2980	0.1947	0.1329	0.1750	0.1788
F (Wald)	3.70***	3.59***	2.04**	17.02**	1.79*	1.84*
Hausman test	Prob > chi2 = 0.0299	Prob > chi2 = 0.0183	Prob > chi2 = 0.0436	Prob > chi2 = 0.0505	Prob > chi2 = 0.0262	Prob > chi2 = 0.0234

*, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. T-statistics are in the parenthesis.
Source: Authors' calculation

O'Brien *et al*. (2014), Jing (2017), Le and Phan (2017), Mardones and Cuneo (2020), Pamplona and da Silva (2020), and Spitsin *et al*. (2020) found that capital structure has a non-linear relationship with financial performance. We also include the square of LEV, SLEV, and LLEV in Models (1)-(6), respectively. However, the quadratic relationship is not significant.

5. Conclusion

This paper aims to determine the impact of capital structure on financial performance based on the data from Chinese agricultural listed companies during 2013-2019. The main conclusions of this paper are summarized in three aspects. First, total debt ratio and short-term debt ratio negatively influence firms' financial performance in China's agricultural sector, whereas long-term debt ratio has no significant impact. Second, the impact of total debt ratio and short-term debt ratio in POEs is greater than that in SOEs. Third, the impact of total debt ratio in central and western regions is greater than that in eastern region.

This paper puts forward some practical implications. First, agricultural listed companies should identify an optimal capital structure in order to maximize shareholders' wealth. Second, managers may reasonably employ more proportion of long-term debt to finance their operation. Third, agricultural companies in central and western regions need to strengthen capital structure and reduce the level of short-term debt in order to prevent debt risk. Finally, for POEs or companies in central and western regions, more preferential policies should be implemented by the government to reduce loan costs and stimulate the development of other sources of financing.

There are some limitations that need to acknowledge in this paper. We have only focused on agricultural sector, and the results could be extended to comparative analyses of other sectors. In addition, other factors that influence financial performance should be included in future studies.

6. References

AHMED, F.; TALREJA, S.; KASHIF, M. Effects of corporate governance and capital structure on firms' performance: Evidence from major sectors of Pakistan. *Indonesian Capital Market Review*, v. 10, n. 2, p. 90-104, 2018.

AHMED, R.; BHUYAN, R. Capital structure and firm performance in Australian service sector firms: A panel data analysis. *Journal of Risk and Financial Management*, v. 13, n. 9, p. 214, 2020.

ALI, A.; FAISAL, S. Capital structure and financial performance: A case of Saudi petrochemical industry. *The Journal of Asian Finance, Economics and Business*, v. 7, n. 7, p. 105-112, 2020.

ARCAS, M.J.; BACHILLER, P. Performance of capital structure of privatized firms in Europe. *Global Economic Review*, v. 37, n. 1, p. 107-123, 2008.

BANDYOPADHYAY, A.; BARUA, N.M. Factors determining capital structure and corporate performance in India: Studying the business cycle effects. *The Quarterly Review of*

Economics and Finance, v. 61, p. 160-172, 2016.

BI, K.L.; CHEN, Y.M. Study on the relation between capital structure and corporate performance of listed agricultural company. *Journal of Anhui Agricultural Sciences*, v. 34, n. 19, p. 5118-5119, 2006.

BISTROVA, J.; LACE, N.; PELECKIENĖ, V. The influence of capital structure on Baltic corporate performance. *Journal of Business Economics and Management*, v. 12, n. 4, p. 655-669, 2011.

CHEN, J.-F. Empirical study on the relationship between the capital structure and the financial performance of the listed agricultural companies. *Journal of Fujian Agriculture and Forestry University (Philosophy and Social Sciences)*, v. 12, n. 6, p. 60-63, 2009.

DINH, H.T.; PHAM, C.D. The effect of capital structure on financial performance of Vietnamese listing pharmaceutical enterprises. *The Journal of Asian Finance, Economics and Business*, v. 7, n. 9, p. 329-340, 2020.

GOYAL, A.M. Impact of capital structure on performance of listed public sector banks in India. *International Journal of Business Management Invention*, v. 2, n. 10, p. 35-43, 2013.

JIANG, Z.S.; ZHAO, X.Z.; ZHOU, J. Does the supervision mechanism promote the incentive effects of government innovation support on the R&D input of agricultural enterprises? 2020. (available at: https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9309306)

JIN, Z.J.; SHANG, Y.; XU, J. The impact of government subsidies on private R&D and firm performance: Does ownership matter in China's manufacturing industry? *Sustainability*, v. 10, n. 7, p. 2205, 2018.

JING, X.X. Influence research of capital structure on performance of listed real estate enterprises in China. 2017.
(available at: https://www.atlantis-press.com/article/25882755.pdf)

KNEŽEVIĆ, G.; PAVLOVI Ć, V.; BOJIČIĆ, R. Does the board gender diversity impact financial performance in agriculture? Case of Serbian Agriculture Companies listed on Stock Exchange. *Custos e Agronegocio On Line*, v. 13, n. 3, p. 2-20, 2017.

LE, T.P.V.; PHAN, T.B.N. Capital structure and firm performance: Empirical evidence from a small transition country. *Research in International Business and Finance*, v. 42, p. 710-726, 2017.

LI, P. An empirical study on the influence of capital structure on the performance of agricultural listed companies. *Shanxi Science Technology*, v. 35, n. 5, p. 116-121, 2020.

LIN, X.; JIA, X.-W. Influencing factors and optimization of agricultural listed companies in China. *Asian Agricultural Research*, v. 1, n. 7, p. 41-44, 2009.

LIOUS, N.A.T.; IRENE, P.F.; PILAR, C.F. Capital structure determinants: evidence from Spanish listed firms. *Custos e Agronegocio On Line*, v. 12, n. 3, p. 303-328, 2016.

MAJUMDAR, S.K.; CHHIBBER, P. Capital structure and performance: Evidence from a transition economy on an aspect of corporate governance. *Public Choice*, v. 98, n. 3-4, p. 287-305, 1999.

MARDONES, J.G.; CUNEO, G.R. Capital structure and performance in Latin American companies. *Economic Research-Ekonomska Istraživanja*, v. 33, n. 1, p. 2171-2188, 2020.

MARGARITIS, D.; PSILLAKI, M. Capital structure, equity ownership, and firm performance. *Journal of Banking & Finance*, v. 34, n. 3, p. 621-632, 2010.

MEGGINSON, W.L.; NASH, R.C.; VAN RANDENBOURGH, M. The financial and operating performance of newly privatized firms: An international empirical analysis. *The Journal of Finance*, v. 49, n. 2, p. 403-452, 1994.

MODIGLIANI, F.; MILLER, M.H. The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, v. 48, n. 3, p. 261-297, 1958.

MODIGLIANI, F.; MILLER, M.H. Corporate income taxes and the cost of capital: A correction. *The American Economic Review*, v. 53, n. 3, p. 433-443, 1963.

MOHAMMAD, H.S.; BUJANG, I. Capital structure and financial performance: Evidence from three Malaysian industries. *International Journal of Business and Society*, v. 21, n. 3, p. 1153-1171, 2020.

MURSALIM; MALLISA, M.; KUSUMA, H. Capital structure determinants and firms' performance: Empirical evidence from Thailand, Indonesia and Malaysia. *Polish Journal of Management Studies*, v. 16, n. 1, p. 154-164, 2017.

MUSAH, A. The impact of capital structure on profitability of commercial banks in Ghana. *Asian Journal of Economic Modelling*, v. 6, n. 1, p. 21-36, 2017.

NENU, E.A.; VINTILĂ, G.; GHERGHINA, Ş.C. The impact of capital structure on risk and firm performance: Empirical evidence for the Bucharest Stock Exchange listed companies. *International Journal of Financial Studies*, v. 6, n. 2, p. 41, 2018.

NORVAISIENE, R. The impact of capital structure on the performance efficiency of Baltic listed companies. *Inzinerine Ekonomika-Engineering Economics*, v. 23, n. 5, p. 505-516, 2012.

NGUYEN H.T.; NGUYEN, A.H. The impact of capital structure on firm performance: Evidence from Vietnam. *The Journal of Asian Finance, Economics and Business*, v. 7, n. 4, p. 97-105, 2020.

O'BRIEN, J.P.; DAVID, P.; YOSHIKAWA, T.; DELIOS, A. How capital structure influences diversification performance: A transaction cost perspective. *Strategic Management Journal*, v. 35, n. 7, p. 1013-1031, 2014.

OLOKOYO, F.O. Capital structure and corporate performance of Nigerian quoted firms: A panel data approach. *African Development Review*, v. 25, n. 3, p. 358-369, 2013.

ÖZCAN, İ.Ç. Capital structure and firm performance: Evidence from the airport industry. *European Journal of Transport and Infrastructure Research*, v. 19, n. 3, p. 177-195, 2019.

PAMPLONA, E.; DA SILVA, T.P. Influence of the capital structure in the performance of Brazilian companies from a nonlinear perspective. *Estudios Gerenciales*, v. 36, n. 157, p. 415-427, 2020.

PARK, K.; JANG, S. Capital structure, free cash flow, diversification and firm performance: A holistic analysis. *International Journal of Hospitality Management*, v.33, p. 51-63, 2013.

PARVIN, S.S.; HOSSAIN, B.; MOHIUDDIN, M.; CAO, Q.F. Capital structure, financial performance, and sustainability of micro-finance institutions (MFIs) in Bangladesh. *Sustainability*, v. 12, n. 15, p. 6222, 2020.

PHILLIPS, P.A.; SIPAHIOGLU, M.A. Performance implications of capital structure: Evidence from quoted UK organisations with hotel interests. *The Service Industries Journal*, v. 24, n. 5, p. 31-51, 2004.

PINTO, P; QUADRAS, J.M. Impact of capital structure on financial performance of banks. *JIMS8M: The Journal of Indian Management & Strategy*, v. 21, n. 3, p. 54-59, 2016.

RAMLI, N.A.; LATAN, H.; SOLOVIDA, G.T. Determinants of capital structure and financial performance-A PLS-SEM approach: Evidence from Malaysia and Indonesia. *The Quarterly Review of Economics and Finance*, v. 71, p. 148-160, 2019.

SIDDIK, M.N.A.; KABIRAJ, S.; JOGHEE, S. Impacts of capital structure on performance of banks in a developing economy: Evidence from Bangladesh. *International Journal of Financial Studies*, v. 5, n. 2, p. 13, 2017.

SPITSIN, V.; VUKOVIC, D.; ANOKHIN, S.; SPITSINA, L. Company performance and optimal capital structure: evidence of transition economy (Russia). *Journal of Economic Studies*. 2020.

TIAN, L.H. Government shareholding and the value of China's modern firms. 2001. (available at: https://pdfs.semanticscholar.org/7eb0/02fca6174cfcacb72615ff4ed9bd1e445eda.pdf)

ULLAH, A.; PINGLU, C.; ULLAH, S.; ZAMAN, M.; HASHMI, S.H. The nexus between capital structure, firm-specific factors, macroeconomic factors and financial performance in the textile sector of Pakistan. *Heliyon*, v. 6, n. 8, p. e04741, 2020.

WASSIE, F.A. Impacts of capital structure: profitability of construction companies in Ethiopia. *Journal of Financial Management of Property and Construction*, v. 25, n. 3, p. 371-386, 2020.

WEI, X.Y.; CHE, H.Y.; SHENG, N.; Hsiao, C.Y.-L.; TONG, Q.; YAN, G.Y. Research on the development status of China's renewable energy industry-The impact of capital structure on company performance. *Frontiers in Energy Research*, v. 8, p. 71, 2020.

WIDYANINGRUM, Y. The influence of profitability, asset structure, and firm size to corporate capital structure (Empirical study on manufacturing companies listed in Bursa Efek Indonesia for period 2010-2013). 2015.
(available at: http://eprints.uny.ac.id/19099/1/YunitaWidyaningrum_11408144073.pdf)

XIE, B.S.; WANG, G.H.; WANG, S.H. Does biological assets affect the firms' cost of debt capital? evidence from chinese listed agriculture firms. *Custos e Agronegocio On Line*, v. 15, n. 2, p. 22-47, 2019.

XU, J.; LI, J.S. Performance comparison of food processing and manufacturing companies in China. *Custos e Agronegocio On Line*, v. 16, n. 3, p. 290-308, 2020.

XU, J.; WANG, B.H. Intellectual capital and financial performance of Chinese agricultural listed companies. *Custos e Agronegocio On Line*, v. 15, n. 1, p. 273-290, 2019.

ZHANG, T.L.; REN, J.Z. Empirical study on the relationship between agricultural listed company's capital structure and its enterprise value. *Journal of Anhui Agricultural Sciences*, v. 37, n. 31, p. 15499-15501, 2009.

ZIMMER, D.L.; BILIBIO, J.P.; MICHELS A. The financial and economic performance indexes of agribusiness companies listed in the B3 S.A. *Custos e Agronegocio On Line*, v. 15,

n. 2, p. 405-438, 2019.

7. Acknowledgements

This research was financially supported by the project "Research on the application of management accounting tools in enterprises" (Grant Number 6602420738).

Appendix

Table 10: Descriptive statistics by company ownership

Variable (Mean)	SOEs	POEs	Difference *t*-statistic
ROA	0.0063	0.0290	-1.141**
ROE	-0.0169	0.0028	-0.316
LEV	0.4408	0.3880	2.165**
SLEV	0.1545	0.1288	1.592
LLEV	0.0556	0.0356	2.048***
SIZE	21.7344	21.9327	-1.591
SALES	0.0542	0.1755	-2.540***
FIX	0.2411	0.2944	-2.755***
CR	2.9496	2.2367	1.586***
GDP	0.0687	0.0682	0.868

** and *** indicate significance at the 5% and 1% level, respectively.
Source: Authors' calculation

Table 11: Descriptive statistics by company location

Variable (Mean)	Companies in eastern region	Companies in central and western regions	Difference *t*-statistic
ROA	0.0346	0.0014	1.670
ROE	0.0289	-0.0425	1.150
LEV	0.3774	0.4498	-2.992
SLEV	0.1349	0.1476	-0.782
LLEV	0.0573	0.0331	2.504***
SIZE	21.9890	21.6840	2.466***
SALES	0.1377	0.0963	0.857
FIX	0.2891	0.2482	2.104***
CR	2.4841	2.6770	-0.427*
GDP	0.0684	0.6854	-0.276

* and *** indicate significance at the 10% and 1% level, respectively.
Source: Authors' calculation