Factors influencing supply chain finance of real estate sector: Evidence using GMM estimation

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CHRONICLE	ABSTRACT
	The paper analyzes factors which exert significant impact on supply chain finance (SCF) of real estate sector in Vietnam. Since this interesting topic has not been commonly investigated in empirical research, its results will be meaningful not only on Vietnam but also on other economies. By employing generalized method of moment (GMM) in estimation, the authors report the negative impact of firm profitability (ROA), financial leverage (LEV), firm size (SIZE) and economic growth (GDP) on supply chain finance (SCF). These valuable findings are essential for consideration by the management in improving supply chain finance, especially that of real estate sector.

1. Introduction

Supply chain finance (SCF) participation and improvement is a big concern of many businesses (Bui, 2020). Indeed, competition has taken place not only among firms but also among supply chains (Deng & Sen, 2017) in the twenty-first century. This participation and improvement bring firms more opportunities to access to capital (Marak & Pillai, 2019), optimize their financial flows (Pfohl & Gomm, 2009) as well as working capital (Raghavan & Mishra, 2011) and more specially, improve their performance (Lekkakos & Serrano, 2016). Thus, SCF is always received special attention, particularly after the global financial crisis in 2007 (Marak & Pillai, 2019). Despite its importance, SCF is a rare topic in empirical studies (Caniato et al., 2016) which mostly are conducted by surveys and interviews (Dong et al., 2007). Only few researchers utilize companies' financial reports to examine the correlation between SCF and firm profitability like Zhang et al. (2019) and Bui (2020). In spite of theoretical and practical needs, there is a lack of analyses on influential factors correlated to SCF which may provide the management a reliable basis to its improvement. Thus, this paper is expected to fill in the research gap. More specially, its data are collected form real estate firms in Vietnam, an emerging country, which has experienced difficult periods caused by the global financial crisis since the end of 2007 and national economic predicaments in the 2011-2012 period. These indirectly put many Vietnam real estate companies to trouble in accessing to capital from credit institutions and stock market. Facing these predicaments, they choose to expand their trade credit of suppliers in order to optimize working
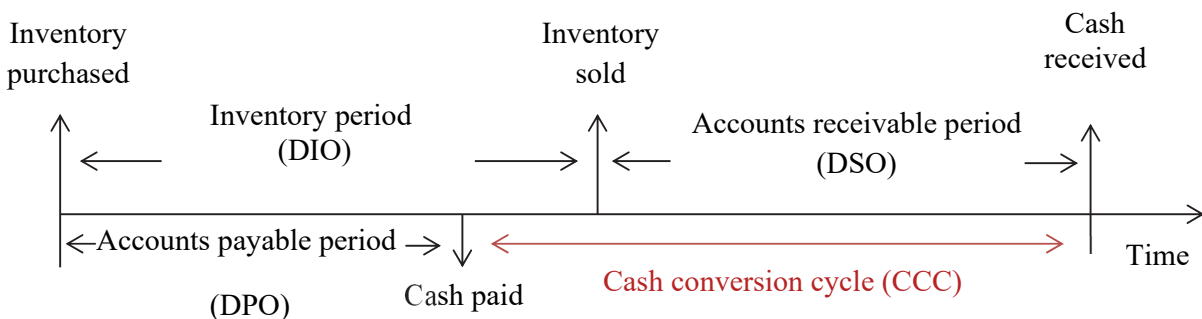
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capital and complete supply chain finance (Polak et al., 2012). Alternatively speaking, it is more vital for real estate firms to participate in supply chain finance to reach working capital optimization. By this study, the authors expect to give first empirical evidence on factors which influence supply chain finance of Vietnam housing industry to provide the management a basis for its improvement.

2. Literature review

Supply chain finance was first examined in empirical studies at the beginning of twenty-first century (Pfohl & Gomm, 2009; Marak & Pillai, 2019). Particularly, supply chain finance has been analysed more since the global financial crisis. It is because the participation and improvement in supply chain finance is an effective solution for businesses to optimize their working capital when their loans from banks and other financial institutions considerably decrease during economic difficult periods (Marak & Pillai, 2019). In other words, supply chain finance plays an essential role in the short-term credit supply and the optimization of working capital for both buyers and sellers (Bui, 2020), thereby speeding up cash conversion, boosting the financial connection among its participants (Wuttke et al., 2013), and more importantly stabilize the entire supply chain (Bui, 2020). With its role in the optimization of working capital, supply chain finance is usually measured by indicator of cash conversion cycle (CCC) (Chang, 2018; Zhang et al., 2019, Bui, 2020) which is defined as the period starting from the cash outlay to cash recovery (Figure 1). To shorten CCC means that the time for cash recovery becomes shorter and companies can increase their working capital. In other terms, supply chain finance performs more effectively. Not only being an indicator of the firm performance in working capital management, supply chain finance is also a major key in managing the entire supply chain (Farris & Hutchison, 2002).

Source: Zhang et al. (2019).

Fig. 1. Cash conversion cycle (CCC)

There have been few studies analysing factors influencing supply chain finance. Zhang (2015) highlighted the impact of external factors (particularly macroeconomic ones). Recently, Caniato et al. (2018) stated that financial strength has a significant role in completing supply chain finance. With the analysis of 31,612 firms among 46 countries in the 1994-2011 period, Chang (2018) revealed the negative effect of firm size and financial leverage on supply chain finance. The results of another study conducted among a group of companies in 19 years by Carnovale et al. (2019) reported that firm size exerts the negative impact on supply chain finance. Generally speaking, supply chain finance is an interesting and necessary research topic. However, there is a big research gap with a humble number of studies examining drivers of supply chain finance. Based on some earlier empirical studies reviewed, it can be concluded that supply chain finance is correlated to firm size, financial leverage, financial strength and external factors (i.e. macroeconomic ones). Based on these, the author proposes the research model of the determinants influencing supply chain finance in the next part.
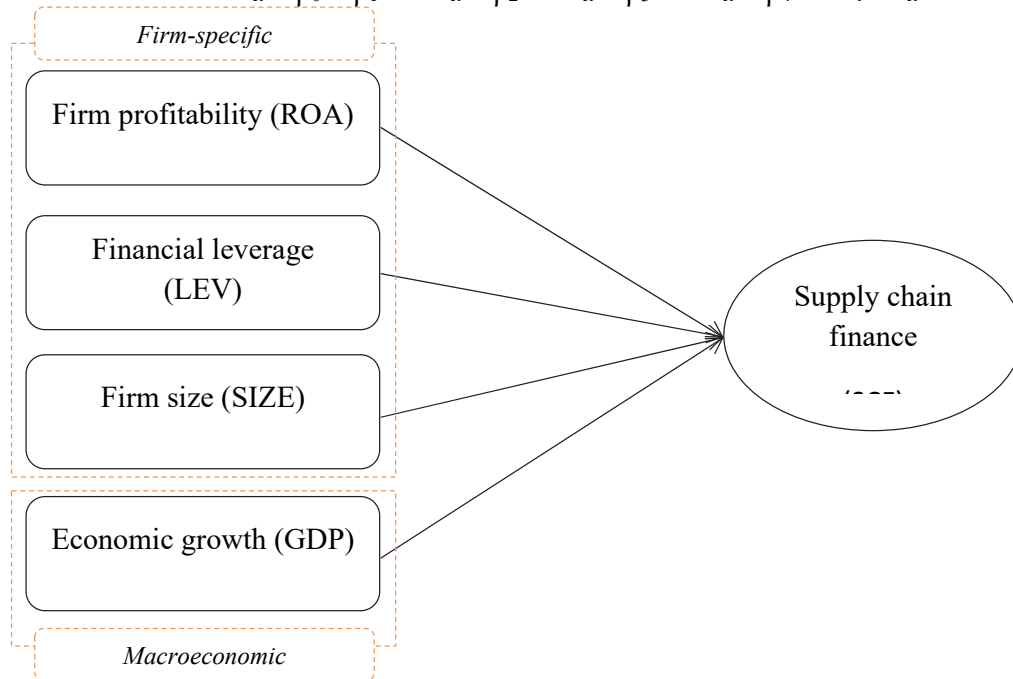
3. Data and methodology

3.1. Data collection

The authors collected panel data from 2013 to 2017. This was the period when Vietnam economy underwent many predicaments in accessing to capital from banking system and stock marker, so the

participation and improvement in supply chain finance is specially considered. Firm-specific data are extracted from financial statements of 35 real estate companies listed on Ho Chi Minh stock exchange while macroeconomic data are done from database of World Bank.

3.2. Methodology

With the objective of testing drivers of supply chain finance in real estate sector, the authors estimated the model by adopting panel data regression. First, the authors employed three basic panel data regressions which are Pooled regression (Pooled OLS), Fixed effects model (FEM) and Random effects model (REM). Then, F test and Hausman test are adopted to select the most appropriate model among the three models. Based on these estimators, the authors conducted hypothesis testing in regression analysis, including multicollinearity, heteroscedasticity and autocorrelation. If the hypothesis of any model is accepted, its estimated results will be used. Inversely, the authors will adopt generalized method of moment (GMM) estimation to fix rejected hypotheses because of its superiority in analysing movements of financial determinants (Driffill et al., 1998). Additionally, GMM can address potential endogeneity, heteroskedasticity, and autocorrelation problems (Doytch & Uctum, 2011). Following the results of earlier studies, the author measures supply chain finance by cash conversion cycle (CCC). Regarding other factors, firm profitability (ROA), financial leverage (LEV), firm size (SIZE) and economic growth (GDP) are examined in the current study. In which, financial leverage (LEV) is included according to Chang (2018) while firm size (SIZE) is done following Chang (2018) and Carnovale et al. (2019). To corroborate what was suggested by Caniato et al. (2018), the authors included firm profitability (ROA) as an indicator of firm financial performance as well as strength. Economic growth (GPD) is involved in the model based on suggestion of Zhang (2015) as an important macroeconomic indicator of an economy. Therefore, the research model is proposed with the following equation:

$$SCF_{it} = \beta_0 + \beta_1\, ROA_{it} + \beta_2\, LEV_{it} + \beta_3\, SIZE_{it} + \beta_4\, GDP_t + \varepsilon_{it}$$

Source: Computed by the author.

Fig. 2. Factors influencing SCF of real estate market

Where:

Dependent variable: Supply chain finance (SCF).

Independent variables: Firm profitability (ROA), financial leverage (LEV), firm size (SIZE), economic growth (GDP).

Table 1

Summary of variables

Variable name	Code	Measurement
		Dependent variable
Supply chain finance	SCF	Logarithm of cash conversion cycle
		Cash conversion cycle (CCC) = Days receivable + Days inventories - Days payable
		= (trade receivable / sales) × 365 + (total inventories / cost of goods sold) × 365
		- (trades payable / cost of goods sold) × 365
		Independent variables
Firm profitability	ROA	Net income / Total assets
Financial leverage	LEV	Total debt / Total assets
Firm size	SIZE	Logarithm of total assets
Economic growth	GDP	Annual growth of gross domestic product

Source: Computed by the author.

4. Empirical results

Variable correlations are shown in the following table:

Table 2

Variable correlations

	SCF	ROA	LEV	SIZE	GDP
SCF	1.000				
ROA	-0.267	1.000			
LEV	-0.127	-0.187	1.000		
SIZE	-0.251	0.278	0.108	1.000	
GDP	-0.231	0.365	-0.004	0.106	1.000

Source: Computed by the author.

The results reveal that independent variables are negatively correlated to supply chain finance (Table 2). Next, the author estimates the model using panel data regression which include Pooled Regression model (Pooled OLS), Fixed effects model (FEM) and Random effects model (REM).

Table 3

Regression results (Pooled OLS, FEM and REM)

SCF	Pooled OLS	FEM	REM
Constant	13.753***	29.103***	24.964***
ROA	-0.047**	-0.031***	-0.036***
LEV	-0.010**	0.013**	0.009*
SIZE	-0.148**	-0.814***	-0.641***
GDP	-0.378*	-0.231**	-0.267***
R^2	14.53%	61.39%	60.62%
Significance level	$F(4, 170) = 7.23$ $Prob > F = 0.0000$***	$F(4, 136) = 54.06$ $Prob > F = 0.0000$***	Wald chi2(4) = 162.36 $Prob > chi2 = 0.0000$***
F test	$F(34, 136) = 20.16$ $Prob > F = 0.000$***		
Hausman test	$chi2(4) = 104.47$ $Prob > chi2 = 0.000$***		

Note: *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.   Source: Computed by the author.

Table 3 indicates that the fixed effects model (FEM) is more appropriate when F-test resulting F(34, 136) = 20.16 has statistical significance at the 1% level and Hausman test resulting $Chi^2(4) = 104.47$ is significant at the 1% level. Accordingly, the fixed effects model (FEM) is chosen for the estimation.

Table 4

Results of tests on multicollinearity, heteroscedasticity and autocorrelation

Multicollinearity test			Heteroscedasticity test	Autocorrelation test
Variable	VIF	Tolerance		
ROA	1.31	0.763		
LEV	1.07	0.933	chi2 (35) = 20,473.05	F(1, 34) = 21.368
SIZE	1.12	0.896	$Prob > chi2 = 0.000$***	$Prob > F = 0.000$***
GDP	1.16	0.862		
Mean VIF = 1.16				

Note: *** indicates significance at the 1% level.
Source: Computed by the author.

It can be seen there are no serious problems of multicollinearity. However, heteroscedasticity and autocorrelation really exist. Thus, the model is estimated by adopting the generalized method of moment (GMM) in order to avoid heteroscedasticity and autocorrelation issues. Also, GMM addresses potential endogeneity.

Table 5

GMM estimation results

SCF	Coef.	P>|z|
Constant	15.508	0.000***
ROA	-0.064	0.019**
LEV	-0.006	0.055*
SIZE	-0.265	0.000***
GDP	-0.184	0.098*
Significance level	Wald chi2(3) = 193.31 Prob > chi2 = 0.000***	
Number of instruments	9	
Number of groups	35	
Arellano-Bond test for AR(2) in first differences	z = -0.93 Pr > z = 0.353	
Sargan test	chi2(4) = 1.69 Prob > chi2 = 0.792	

Note: *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.
Source: Computed by the author.

Table 5 shows that the results of GMM estimator are appropriate and valid at the 1% level of significance. It can be deduced that supply chain finance was influenced by firm-specific and macroeconomic determinants. In particular, supply chain finance (SCF) was negatively associated with ROA (β = -0.064, significance at the 5% level), LEV (β = -0.006, significance at the 10% level), SIZE (β = -0.265, significance at the 1% level) and GDP (β = -0.184, significance at the 10% level).

***The impact of profitability on supply chain finance*:** Firm profitability (ROA) exerts negative effects (-0.064) on supply chain finance (SCF) at the 5% level of significance. It can be seen that the increase in profitability of the participants' profitability facilitates them to enhance their financial resources (from remained earnings or additional capital raising) for the supply chain finance participation, shorten cash conversion cycle. In other words, it helps supply chain finance perform well. This finding is a novelty of the study compared to earlier ones.

***The impact of financial leverage on supply chain finance*:** Financial leverage (LEV) is negatively correlated (-0.006) to supply chain finance (SCF) at the 10% level of significance. This indicates that the increase in financial leverage of the participants leads to the increase in their financial resources (by loans) in order to participate in supply chain finance. Then, these firms tend to constrain time of capital tie-up, shorten cash conversion cycle and indirectly raise the performance of supply chain finance. This finding is consistent with what was reported by Chang (2018).

***The impact of firm size on supply chain finance*:** Firm size (SIZE) is negatively related (-0.265) to supply chain finance (SCF) at the 1% level of significance. This finding shows that the participation of large firms in supply chain finance boosts its performance by shorten CCC. This result corroborates those of Chang (2018) and Carnovale et al. (2019).

***The impact of economic growth on supply chain finance*:** Economic growth (GDP) has a negative impact (-0.184) supply chain finance (SCF) at the 10% level of significance. Thus, a well-developed economy plays a key role in stimulating supply chain finance perform better (CCC shortened). This result has not been found in earlier studies.

5. Conclusions

The paper successfully achieves its goals by identifying the determinants affecting supply chain finance of real estate sector in Vietnam. This is a nascent topic, so these results are essential not only for Vietnam but also for other economies. The results confirm the negative impact of firm size and financial leverage on supply chain finance, thereby corroborating what was reported by Chang (2018) and Carnovale et al. (2019). More importantly, based on suggestions by Zhang (2015) and Caniato et al. (2018), the author finds the negative effect of firm profitability and economic growth on supply chain finance that brings a big success to this study. The findings provide a valuable basis for the management in improving supply chain finance, particularly in housing market. Also, some implications are

suggested to improve the performance of supply chain finance as follows: (1) It is necessary to raise profits of the participants that contributes to the better performance of supply chain finance. (2) Together with the mobilization of short-term trade credits from supply chain finance, the participants need to make plans in order to attract more medium- and long-term capital from banks and stock market; (3) The participation of large firms should be increased so that the strength and performance of supply chain finance are enhanced; (4) Along with the consideration in firm-specific factors, economic growth should be considered. Therefore, it is essential for the management to provide forecast about macroeconomic situations to establish suitable policies. Despite its success, the paper has its limitations for this uncommon research topic. One of them is that some factors such as the application of technology, firm's demands for the participation in supply chain finance have not been examined. This may be an interesting proposal for future research.

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