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Financial development, financial constraint, and firm investment: Evidence from Thailand

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ABSTRACT

This paper examines the effect of firm financial constraint and financial development on firm investment using data from non-financial companies in Thailand from 1999Q1 to 2015Q4. The empirical results showed a significant effect of firm financial constraint on their investment. The cash flow of firms had a positive effect on firm investment, while the leverage ratio of firms had a negative effect. Financial development also weakened the effect of firm financial constraint on firm investment. These effects were considerably higher in more financially constrained firms than less constrained ones.

Introduction

Financial condition, or the financial constraint of a firm, is an important factor influencing firm investment. According to Farre-Mensa and Ljungqvist (2013) and Silva and Carreira (2012), financial constraint can be a measure of the firm's financial condition or the firm's balance sheet condition, such as firm cash flow, leverage, and size. In this case, the greater the financial constraint of firms, the weaker the firm's financial condition. Also, firm investment is usually considered as the firm's fix assets, such as property, plant, equipment, and their depreciation (Bhaduri, 2005; Rungsomboon, 2005; Soumaya, 2012). Regarding the theory of firm investment, financially constrained firms are considered to have a weaker balance sheet condition and hence higher external funding costs, compared to those with lower financial constraints. This is because more financially constrained firms will have relatively low liquidity and capital as well as a higher default risk. As a result, the more financial constraint a firm has, the lower the firm investment, as firms will have greater difficulty in investing and finding external funding sources (Agca & Mozumdar, 2008; Butzen, Fuss, & Vermeulen, 2001; Gilchrist & Himmelberg, 1995; Rungsomboon, 2005). Bond, Elston, Mairesse, and Mulkay (1997) and Chatelain, Generale, Hernando, Von Kalckreuth, and Vermeulen (2003) explained that the financial condition of firms, including cash flow and firm size, can affect firm investment. Angelopoulou and Gibson (2007) and Guariglia (1999) also showed that leverage and the dividend payout ratio of firms can also affect firm investments. They explained that large firms with high cash flow, dividends, and with low leverage, will have less financial constraint. These firms generally have more opportunities to extend their investment compared with more constrained ones. Apart from firm financial constraint or condition, financial development can also influence investment, and affect the relationship between financial constraint and investment. According to Demirgüç-Kunt and Levine (2008) and Singh, Razi, Endut, and Ramlee (2008), financial development is the condition where there is the development of financial intermediaries and markets including financial institution development and capital market development. The effect

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of financial development can weaken the impact of financial constraint on firm investment. Laeven (2003) and Love (2003) stated that financial development through banking sector and capital market development can support the firm balance sheet condition by increasing external funding opportunities and increasing investment opportunities for firms. This reduces the dependence of firms on their internal funding sources as well as improving the firm financial condition. Therefore, the effect of firm financial constraint on firm investment will become weaker when there is financial development that facilitates the firm increasing its investment by using its external funding sources to fund investment compared with previously using internal funds (Galindo, Schiantarelli, & Weiss, 2007).

Several studies have focused on the relationship between financial constraint, financial development, and firm investment, particularly the effect of financial constraint on firm investment, mainly in developed countries (Agca & Mozumdar, 2008; Bond et al., 1997; Chatelain et al., 2003; Chatelain & Tiomo, 2001; Love, 2003). Study on the effect of financial development on firm investment is still limited. Such study mostly focuses on developed countries and also on the individual aspect of financial development such as financial liberalization (Gelos & Werner, 2002; Harris, Schiantarelli, & Siregar, 1994; Schiantarelli, Weiss, & Jaramillo, 1996) and capital market development (Islam & Mozumdar, 2007; Laeven, 2003; Love, 2003). Therefore, this has resulted in a lack of case studies in developing countries, including Thailand and also of the study of the role of financial development and the effect of financial constraint on firm investment. Therefore, this paper aims to fill the gap by introducing an evidential study of Thailand as a case study of a developing Asian country. The aims of the paper are first to study the effect of firm financial constraint or financial condition on firm investment in Thailand, and second to examine the effect of financial development on firm investment or the way in which the financial constraint of firms affects their investment. This paper has three main motivations: First, this study fulfills the gap in the literature by also studying the influence of financial development on the way in which financial constraint affects firm investment which was rarely considered in the reviewed literature. In this case, we also focus on both aspects of financial development including banking sector development and capital market development in order to obtain more aspects of the influence of financial development on the way in which firm financial constraint affects their investment, as well as to supplement the previous papers which only focused on individual aspects of financial development. Second, we fill the gap in previous studies especially with regard to the effect of firm financial constraint or financial condition on firm investment, which previously was mostly focused on developed countries, by introducing an evidence study of Thailand as a case study of a developing Asian country. Concerning this study, the effect of financial constraint on firm investment as well as the effects of financial development on the way in which the financial constraint of firms affects their investment will be different from those in developed countries because the financial market in developed countries is considered to be more financially developed regarding size, capital, and liquidity compared to developing countries (Beck, Demirgüç-Kunt, & Levine, 2009; Beck & Levine, 2002). Consequently, the effect of financial constraint on firm investment as well as the effect of financial development on the way in which financial constraint affects firm investment will possibly be greater in a developing market than in developed ones because firms in a developing market will have greater difficulty in obtaining external funding sources compared to firms in a developed market. Thus, firm investment in a less-developed market will depend more on the firm's internal source of funds as well as firm financial constraint, and the effect of financial development on the way in which financial constraint affects firm investment will become greater relative to a developed market in which there is more opportunity to obtain funding sources from the financial market. Therefore, this paper will shed light on a case study in a developing country, Thailand, which will has a relatively less-developed financial market than those cases reported in the literature in developed markets. Third, regarding the evidence study in Thailand, there is a lack of the study on both the effect of financial constraint on firm investment as well as the effect of financial development on the way that financial constraint affects firm investment. In addition, regarding financial market development in Thailand, the financial situation in Thailand has been continually developing, especially after the financial crisis period in 1997. Between 1998 and 2001, there was significant financial development focus on restructuring plans to support liquidity in the financial market and capital market development. This was mainly shown by the establishment of a Set-Trade dotcom PLC and Thai-NDVR PLC for electronic securities trading support, and the introduction of BATHNET to support the Thai payment system (Bank of Thailand [BOT], 2002). In 2003, BOT introduced the Financial Sector Master Plan Phase I (2003–2005) in order to expand commercial banking businesses and support capital market development. This was supported by the introduction of the Bond Electronic Exchange (BEX) in 2003, the Derivative Market PLC in 2004, and the Thai Future Exchange market (TFEX) in 2005 (BOT, 2010, 2015). The BOT also issued the Financial Sector Master Plan Phase II (2010–2015), with the aim of supporting financial competition and Thai banking development. This was followed by the issuing of the new Financial Development Master Plan (2016–2020), with the aim of improving financial development in the country in order to join the Asian Economic Community (AEC) (BOT, 2015). We can see that Thai financial development continued to develop since the financial crisis in 1997 and therefore it is worthwhile to conduct an evidence study in Thailand as a case study in an Asian developing country in order to explore how the financial development in the country affects the way that financial constraint of firms affects their investment. The results from this study may assist the BOT and policy makers to apply financial development policy to control the economy, especially through the firm sector in the future.

We first found a significant effect of firm financial constraint on firm investment in Thailand, and second, that financial development weakened the effect of firm financial constraint on firm investment. These effects were higher in

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more financially constrained firms than less constrained ones.

Literature Review

Several papers study the relationship between firm financial constraints and firm investment and find that the better the firm balance sheet condition or the less financial constraint on the firm, the higher their investment. Chatelain et al. (2003) examined the effect of firm financial constraint on firm investment in Germany, France, Italy and Spain and found that an increase in firm cash flow could positively affect the firm investment. Angelopoulou and Gibson (2007) and Kaplan and Zingales (1997) stated that a rise in US firm cash flow would lead to an increase in profit opportunities, improving the financial condition of firms and increasing liquidity and thus raising firm investment. Other studies have also found similar results, such as those by Agca and Mozumdar (2008), Bond et al. (1997), Chatelain and Tiomo (2001). Gaiotti and Generale (2001) found that the effect of firm cash flow on investment in Italy was higher in more financially constrained firms which were considered as small firms, compared with large ones. This result confirms that more financially constrained firms will have fewer opportunities to obtain external funding sources and thus the investment of more financially constrained firms will depend more on their internal funds, namely the firm cash flow, than external funds. Rungsomboon (2005) found that the effect of cash flow on firm investment in Thailand was higher especially in the more financially constraint firms. Similar results were found by Butzen et al. (2001) and Lünnemann and Mathä (2001). Guariglia (1999) showed that a higher leverage ratio of UK firms resulted in a decrease in their investment due to a higher default risk and thus an increased cost of external funding. Agung, Morena, Pramono, and Prastowo (2002), Gilchrist and Himmelberg (1995), Kaplan and Zingales (1997), and Van Ees and Garretsen (1994) stated that the effect of both firm leverage and firm cash flow on investment would be greater in the more financially constrained firms.

Financial development also influences firm investment as well as the way in which financial constraint or financial condition of firms affect firm investment. However, studies in this area are quite limited and mostly focus on developed countries, with no case studies in Thailand. Gelos and Werner (2002) found that the effects of firm cash flow on firm investment were relatively low after the financial liberalization period in Mexico. Similar results were found in the case study reported in Laeven (2003) of a group of developing countries. Islam and Mozumdar (2007), Laeven (2003), and Love (2003) also found that capital market development could weaken the effect of firm cash flow on firm investment and this effect was higher for more financially constrained firms. Furthermore, financial development can lower the dependence of firms on their internal finance and the more financially constrained firms will experience greater effects from financial development compared with less constrained ones, which already have less difficulty in finding external funding sources. Arbeláez and Echavarria (2002), Galindo et al. (2007), and Harris et al. (1994) similarly found that the effect of financial development can lower the effect of a firms' cash flow on its investment, as financial development can raise more opportunities for external funding by the firm and lower its dependence on its internal funds.

For the literature presented previously, the study of the effect of financial constraint on firm investment has been mainly focused on developed countries and study regarding the influence of financial development on the way in which financial constraint affects firm investment is quite limited. These studies only examined an individual aspect of financial development, such as the effect of financial liberalization or capital market development. Moreover, these studies from this aspect mainly considered developed countries, leaving a gap regarding a developing country case study, such as Thailand, which has been rarely study in the reviewed research. Therefore, this study will investigate the effect of financial constraint on firm investment as well as the effect of financial development in terms of both banking sector and capital market development on the way in which financial constraint or financial condition of a firm affect firm investment in order to fill the gap in the reviewed literature.

Methods

Data Collection

The study used data from non-financial companies in Thailand which were listed on the Stock Exchange of Thailand (SET) from 1999Q1 to 2015Q4. These include all firms in the seven industrial sectors in Thailand: the agricultural and food industry, natural resource industry, technological industry, services, industrial goods, consumer goods, and the real estate and construction industry. The total sample of firms consisted of 490 non-financial companies, with 33,320 firm-year observations. The financial market development indicators were obtained from the World Bank Global Financial Development Database (GFDD)[1] and the database of Beck Demirgüç-Kunt, & Levine (1999). Table 1 presents a data description of all variables used in the study and summary statistics of the variables used in the study (number of firms, mean, minimum value, maximum value, and standard deviation). Panel A shows the data description for the total sample of firms in Thailand, Panel B presents the data for the different industrial sectors in Thailand, and Panel C describes the data for the financial development indicators used in this study. The data were truncated at the 1% and 99% percentiles in order to reduce outliner and noise data.

Data Analysis

To examine the effect of firm financial constraint on firm investment, the study used the Euler equation as the baseline empirical model of firm investment. The Euler equation has been applied in many papers because the

[1] The latest financial development indicator data are until 2015 (last updated June 2017).

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Table 1
Summary statistics for study variables from 1999Q1 to 2015Q4

Data	Mean	Min	Max	SD
Panel A: total sample of firms in Thailand (490 firms)				
Ratio of firms' investment and capital stock (I/K)	11.4256	−0.0225	56,842.7000	553.1700
Output to capital stock (Y/K)	4.9394	−0.7108	8,887.6000	69.8210
Cash flow to capital ratio (C/K)	6.2514	−0.8172	42,026.1000	331.6497
Debt to capital ratio (D/K)	5.5009	−1.5557	21,363.1000	187.7971
Panel B: different industrial sectors in Thailand				
Agricultural and food industry (100 firms)				
Ratio of firms' investment and capital stock (I/K)	8.3129	0.0000	19,223.9000	383.0241
Output to capital stock (Y/K)	7.6627	−0.7044	3,874.1400	65.8844
Cash flow to capital ratio (C/K)	5.0811	0.0001	9,248.2900	177.3731
Debt to capital ratio (D/K)	3.4390	−1.6921	1555.2700	36.5090
Natural resource industry (100 firms)				
Ratio of firms' investment and capital stock (I/K)	4.3308	0.0000	349.1490	32.8608
Output to capital stock (Y/K)	2.3243	−0.0035	58.01240	5.8261
Cash flow to capital ratio (C/K)	1.9403	0.0034	991.8490	24.7667
Debt to capital ratio (D/K)	4.9256	0.1071	311.2950	28.5571
Technological industry (100 firms)				
Ratio of firms' investment and capital stock (I/K)	2.4721	0.0000	630.3760	17.3300
Output to capital stock (Y/K)	5.4676	0.0000	8,887.6000	170.4561
Cash flow to capital ratio (C/K)	4.5159	−0.1679	42,013.6000	329.2385
Debt to capital ratio (D/K)	2.6369	0.0000	174.7950	14.1758
Services (100 firms)				
Ratio of firms' investment and capital stock (I/K)	29.8587	0.0000	56,842.7000	1,112.1950
Output to capital stock (Y/K)	10.6869	−0.7108	1,632.9200	46.2669
Cash flow to capital ratio (C/K)	18.7252	0.0000	42,026.1000	695.3333
Debt to capital ratio (D/K)	2.2742	0.0191	482.5650	22.0976
Industrial goods (100 firms)				
Ratio of firms' investment and capital stock (I/K)	3.8774	−0.0225	3,463.5000	73.2998
Output to capital stock (Y/K)	2.5070	−0.3560	746.7090	19.8298
Cash flow to capital ratio (C/K)	2.1600	−0.5540	25.1675	2.9784
Debt to capital ratio (D/K)	5.7619	0.1071	311.2950	28.5571
Consumer goods (100 firms)				
Ratio of firms' investment and capital stock (I/K)	1.2606	−0.0140	81.6472	4.5695
Output to capital stock (Y/K)	2.3375	−0.6082	24.2801	2.8477
Cash flow to capital ratio (C/K)	1.2164	−1.4343	2,842.95	54.5282
Debt to capital ratio (D/K)	4.4419	0.0000	155.7400	14.0713
Real estate and construction industry (100 firms)				
Ratio of firms' investment and capital stock (I/K)	10.4152	0.0000	2,469.7000	64.1231
Output to capital stock (Y/K)	4.0155	0.0000	2.3989	0.2164
Cash flow to capital ratio (C/K)	2.7089	−0.0008	1,576.0900	24.0891
Debt to capital ratio (D/K)	14.3315	0.0000	21,363.1000	318.1233
Panel C: financial development indicators (1999Q – 2015Q4)				
Combination of the depository banks' assets to total financial assets and stock market capitalization to GDP (FD1)	165.8088	123.9060	226.3840	25.6230
Combination of the private credit by depository banks to GDP ratio and stock market capitalization to GDP (FD2)	151.8995	119.4970	196.4130	21.8702

Tobin q model, which was previously used to estimate the investment model, has a measurement problem as the q value used in the model is correct only when there is perfect competition in the production market, fixed capital homogeneity, and no relationship between firm financial structure and investment decisions (Agca & Mozumdar, 2008; Rungsomboon, 2005). These are quite limiting assumptions and thus the Tobin q model is not a suitable proxy for estimation. Therefore, this paper used the Euler equation (Eq. (1)) for the estimation as has been done in several other papers (Bond & Meghir, 1994a, 1994b):

$$\left(\frac{I}{K}\right)_{i,t} = \alpha_1\left(\frac{I}{K}\right)_{i,t-k} + \alpha_2\left(\frac{I}{K}\right)^2_{i,t-k} + \alpha_3\left(\frac{Y}{K}\right)_{i,t-k} + \alpha_4\left(\frac{C}{K}\right)_{i,t-k} + \alpha_5\left(\frac{D}{K}\right)^2_{i,t-k} + \nu_i + \eta_t + \varepsilon_{it} \quad (1)$$

where i is the number of firms (1, 2, 3, … N); t is the time period (1, 2, 3, … T); k is the number of lags (1–4); ν_i is the individual firm's fixed effect; η_t is the time dummy; ε_{it} is the error term; (I/K) is the firm's investment to capital ratio, where I is the firm investment, and K is the capital stock. I is calculated from $I_t = A_t - A_{t-1} + DEP_t$, where A is the net fixed asset and DEP is the firm's depreciation; (Y/K) is the output to capital stock ratio; (C/K) is the cash flow to capital ratio; and (D/K) is the debt to capital ratio. From Eq. (1), the lag ratio of firm investment to capital ratio is expected to have a positive relationship with the ratio of firm investment to capital ratio ($\alpha_1 > 0$). According to Bond and Meghir (1994a, 1994b), the coefficient of $(I/K)^2$ in the Euler equation is expected to be negative ($\alpha_2 < 0$). The coefficient of output to capital stock (Y/K) and the cash flow to capital ratio (C/K) are also expected to be positive (α_3, $\alpha_4 > 0$) as a rise in firm output and cash flow will lead to a better balance sheet condition of firms, increasing their

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investment (Bond et al., 1997; Rungsomboon, 2005). However, the coefficient of the debt to capital ratio $(D/K)^2$ is expected to be negative ($\alpha_5 < 0$), as a higher debt ratio for a firm will represent a higher leverage ratio and more financial constraint in terms of default risk. This causes a reduction in firm investment (Arellano, Bai, & Zhang, 2012; Guariglia, 1999). Eq. (1) is estimated by applying First Difference-GMM estimation based on Arellano and Bond (1991) and also uses System-GMM estimation as the robustness test. For the study of the effect of financial development on the way in which financial constraint of firms affects firm investment, the model is shown in Eq. (2):

$$\left(\frac{I}{K}\right)_{i,t} = \alpha_1\left(\frac{I}{K}\right)_{i,t-k} + \alpha_2\left(\frac{I}{K}\right)^2_{i,t-k} + \alpha_3\left(\frac{Y}{K}\right)_{i,t-k} + \alpha_4\left(\frac{C}{K}\right)_{i,t-k} + \alpha_5\left(\frac{D}{K}\right)^2_{i,t-k} + \alpha_6\left[\left(\frac{C}{K}\right)\times FD\right]_{i,t-k} + \alpha_7\left[\left(\frac{D}{K}\right)^2 \times FD\right]_{i,t-k} + \nu_i + \eta_t + \varepsilon_{it} \quad (2)$$

where FD is the financial development indicators including banking sector and capital market development, based on Beck and Levine (2002). In this case, two main indicators are used: FD1 is a combination of the depository bank's assets to total financial assets and stock market capitalization to GDP, measuring financial development in terms of size; and FD2 is the combination of the private credit by depository banks to GDP ratio and stock market capitalization to GDP, measuring financial development in term of activities. An increase in these financial development indicators shows an expansion in size and activities, such as lending services and trading, in the financial institution and capital market. This results in a rise in the liquidity of the financial market and thus increases the opportunity for firms to obtain external funding sources. This leads to less dependence on internal finances for firm investment. Therefore, the coefficients of $(C/K) \times$ FD and $(D/K)^2 \times$ FD are expected to be negative and positive respectively. In this case, we will estimate the model in Eq. (2) by using FD1 and FD2 using First Difference-GMM and System-GMM estimation, respectively. The robustness test of Eqs. (1) and (2) was performed by dividing the sample into seven subsamples, representing the seven different industrial sectors in Thailand.

Results and Discussion

Results of the Effect of Firm Financial Constraint on Firm Investment

The empirical results of the effect of financial constraint on firm investment are shown in Table 2. The results from the First Difference-GMM estimation in column (1) show that the financial constraint of firms had a significant effect on firm investment in Thailand. The coefficients of the output to capital ratio and of the cash flow to capital ratio were statistically significant and positive. This is in line with expectations, as the higher output and cash flow of firms will result in greater liquidity and ability for firms to obtain external funds. This leads to better firm financial condition and increases investment. Moreover, greater firm cash flow will support higher firm creditworthiness as well as a higher level of internal funds. This condition can increase firm investment (Butzen et al., 2001; Kaplan & Zingales, 1997). This result is also supported by several empirical studies (Angelopoulou & Gibson, 2007; Chatelain et al., 2003; Chatelain & Tiomo, 2001; Rungsomboon, 2005). The coefficient of debt to capital ratio was significantly negative. This is in line with expectations, as higher leverage of firms will show higher financial constraint, making it difficult for firms to find external funding. In addition, higher leverage will present a greater possibility of the default risk of a firm, causing a rise in external financing costs and thus lowering firm investment (Agung et al., 2002; Angelopoulou & Gibson, 2007). Similar results were reported by Guariglia (1999), and Gilchrist and Himmelberg (1995). The results from System-GMM in column (2) are similar to those in column (1), confirming the robustness of the methodology used in the study.

Table 2 presents the results of the effect of financial constraint on firm investment and effect of financial development on the way in which financial constraint affects firm investment.

Results of the Effect of Financial Development on the Way in Which Firm Financial Constraint Affects Firm Investment

The effect of financial development is shown in Table 2, columns (3)–(6). The results show that the effect of firm financial constraint on firm investment remains the same. The results from the First Difference-GMM estimation in columns (3) and (5) show that financial development had a significant effect on firm investment and the way that firm financial constraint affects investment. The coefficients of $(C/K) \times$ FD1 and $(D/K)^2 \times$ FD1 showed statistically significant negative and positive results, respectively, for the effect of financial development in terms of size (FD1). This demonstrates that financial development in terms of size will lead to a larger size in the banking sector, financial institution, and capital market. This results in higher liquidity in the financial market and a greater opportunity for firms to find additional external funding sources. According to Arbeláez and Echavarria (2002) and Harris et al. (1994), this situation leads to a rise in firm investment and a lower dependence of firms on their financial condition (cash flow and leverage) due to firms being able to find other sources to fund their investment instead of using their internal funds. Therefore, this indicator will lower the effect of firm financial constraint (cash flow and leverage) on firm investment. Our results are in line with expectations and previous studies (Arbeláez & Echavarria, 2002; Harris et al., 1994; Laeven, 2003). The coefficients of $(C/K) \times$ FD2 and $(D/K)^2 \times$ FD2 also showed statistically significant negative and positive results, respectively, for the effect of financial development in terms of activities (FD2). This indicates that an increase in the activities of the banking sector and capital market, such as an extension of banking services and financial market trading, will lead to greater liquidity and trading activities through the financial market. This causes a greater opportunity for a firm to

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Table 2
Empirical results of the effect of financial constraint and financial development on firm investment

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	GMM	System-GMM	GMM	System-GMM	GMM	System-GMM
(I/K)						
(t-1)	0.7178*	0.6130*	0.4552	0.6676	0.4277	0.6803*
	(0.3844)	(0.3673)	(0.3811)	(0.4631)	(0.3757)	(0.4101)
(t-2)	0.5943**	0.6741	0.7674*	0.9805	0.8343*	0.9650**
	(0.2638)	(0.6456)	(0.4255)	(0.6135)	(0.4498)	(0.4798)
(t-3)	−0.6617*	−0.5476	0.8476***	0.9422****	−0.8396	0.9174***
	(0.3399)	(0.3.938)	(0.3197)	(0.3301)	(0.6476)	(0.2810)
(t-4)	0.4791	0.4234***	0.1821	0.4339****	0.3245	0.4136***
	(0.2153)	(0.1406)	(0.2688)	(0.1469)	(0.2815)	(0.1324)
$(I/K)^2$						
(t-1)	−0.0008*	−0.0001	−0.0001	−0.0002	−0.0003	−0.0002
	(0.0004)	(0.0001)	(0.0002)	(0.0002)	(0.0003)	(0.0002)
(t-2)	−0.0002	−0.0001	−0.0006	−0.0004*	−0.0009**	−0.0005**
	(0.0001)	(0.0002)	(0.0004)	(0.0002)	(0.0003)	(0.0002)
(t-3)	0.0001	0.0001	0.0007	0.0004	0.0007	−0.0005***
	(0.0002)	(0.0001)	(0.0004)	(0.0003)	(0.0005)	(0.0001)
(t-4)	−0.0002*	−0.0001***	0.0000	−0.0001**	−0.0002	−0.0001**
	(0.0001)	(0.0000)	(0.0003)	(0.0004)	(0.0002)	(0.0000)
(Y/K)						
(t-1)	0.6658*	0.5710*	0.1042	0.6477***	0.1219	0.6897***
	(0.3992)	(0.3079)	(0.2446)	(0.2027)	(0.2216)	(0.2339)
(t-2)	−0.3869	−0.2224	0.0014	0.5593**	0.0681	0.6136***
	(0.4820)	(0.6021)	(0.4318)	(0.2155)	(0.4226)	(0.2271)
(t-3)	0.1722	0.1626	0.1169	0.3476***	0.1573	0.4006***
	(0.4262)	(0.1655)	(0.4574)	(0.1222)	(0.4399)	(0.1246)
(t-4)	−0.1043	−0.1235	−0.1682	0.2272***	−0.2343	0.2642
	(0.6509)	(0.1169)	(0.3223)	(0.0804)	(0.3131)	(0.2065)
(C/K)						
(t-1)	1.3134	0.4332**	1.0652	−1.1010	2.0543	0.5495**
	(1.1355)	(0.1816)	(0.9686)	(0.9567)	(1.7054)	(0.2346)
(t-2)	1.7734*	−0.2335	−0.1558	1.2367*	0.3265	−0.1366
	(0.9582)	(0.5640)	(0.4918)	(0.6559)	(0.4065)	(0.3175)
(t-3)	−0.8024	0.0829	0.4799	0.8045	1.2565	−0.5025
	(0.8206)	(0.4000)	(0.5371)	(0.6284)	(0.8410)	(0.6589)
(t-4)	−1.2934	0.0972	1.5168*	1.2727*	1.2256***	−0.1395
	(0.8776)	(0.2898)	(0.8803)	(0.7247)	(0.4616)	(0.3143)
(D/K)						
(t-1)	0.0013	−0.0001	−0.0161**	−0.0040	−0.0145**	−0.0030
	(0.0021)	(0.0013)	(0.0066)	(0.0085)	(0.0057)	(0.0083)
(t-2)	−0.0021*	−0.0020	0.0011	−0.0069	0.0016	−0.0073
	(0.0011)	(0.0017)	(0.0064)	(0.0069)	(0.0061)	(0.0055)
(t-3)	0.0014	0.0024*	−0.0084	−0.0753***	−0.0107	0.0131**
	(0.0013)	(0.0013)	(0.0114)	(0.0274)	(0.0103)	(0.0053)
(t-4)	0.0011	−0.0015***	−0.0215*	−0.0607***	−0.0235**	−0.0059*
	(0.0012)	(0.0005)	(0.0111)	(0.0171)	(0.0094)	(0.0034)
(C/K) × FD1						
(t-1)			0.0023	−0.0449***		
			(0.0405)	(0.0169)		
(t-2)			0.0222	−0.0347*		
			(0.0334)	(0.0205)		
(t-3)			−0.0911*	0.0753		
			(0.0538)	(0.1274)		
(t-4)			−0.0464	−0.0607***		
			(0.0447)	(0.0107)		
(D/K) × FD1						
(t-1)			0.0001***	0.0000		
			(0.0000)	(0.0000)		
(t-2)			−0.0000	0.0000		
			(0.0000)	(0.0000)		
(t-3)			0.0000	0.0006*		
			(0.0001)	(0.0000)		
(t-4)			0.0001**	0.0000		
			(0.0001)	(0.0000)		
(C/K) × FD2						
(t-1)					−0.0041	−0.0408**
					(0.0501)	(0.0167)
(t-2)					0.0241	−0.0281
					(0.0397)	(0.0171)

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Table 2 (*continued*)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	GMM	System-GMM	GMM	System-GMM	GMM	System-GMM
(t-3)					−0.0922*	−0.0620**
					(0.0513)	(0.0262)
(t-4)					−0.0796	0.1585
					(0.0549)	(0.1155)
$(D/K)^2 \times FD2$						
(t-1)					0.0000	0.0000
					(0.0000)	(0.0000)
(t-2)					0.0000	0.0000
					(0.0000)	(0.0000)
(t-3)					0.0001*	0.0001**
					(0.0001)	(0.0000)
(t-4)					0.000	0.0000
					(0.0001)	(0.0000)
Hansan test	265.78	271.96	189.60	189.08	254.50	255.19

Notes: Columns (1)–(2) show the results of the effect of financial constraint on firm investment, columns (3)–(4) show the results of the effect of financial development in terms of size of financial institution and capital market on firm investment, and columns (5)–(6) present the results of the effect of financial development in terms of the financial institution and capital market on firm investment. The estimation method are First Difference-GMM estimation (GMM) shown in columns (1), (3), and (5) and System-GMM estimation shown in columns (2), (4), and (6). I/K is the ratio of firm investment to capital in which I is calculated from $I_t = K_t - K_{t-1} + DEP_t$, where K is net fixed assets and DEP is the depreciation. Y/K is the output to capital stock ratio, C/K is the cash flow to capital stock ratio, and D/K is the debt to capital ratio, FD1 is the combination of the depository bank's assets to total financial assets and stock market capitalization to GDP, FD2 is the combination of the private credit by depository banks to GDP ratio and stock market capitalization to GDP. Symbols *, **, *** indicate that a coefficient is statistically significant at levels of 10%, 5%, and 1%, respectively.

obtain more funding sources, such as from the financial market and financial institutions as well as lowering the cost of external funds. Thus, this condition will weaken the effect of firm financial constraint on investment as firm investment will depend more on external funds causing by an increase in financial development, instead of depending on the firm internal financial condition (cash flow and leverage of firms) (Arbeláez & Echavarria, 2002; Islam & Mozumdar, 2007; Love, 2003). Thus, this financial development in terms of activities will weaken the effect of firm financial constraint on investment. Similar results were also found in Arbeláez and Echavarria (2002), Harris et al. (1994), Islam and Mozumdar (2007), and Love (2003). Estimating the model using the System-GMM technique in columns (4) and (6) produced results that were similar to those in the First Difference-GMM estimation.

Robustness Test

The robustness test was performed by dividing the total sample of firms into seven different industrial sectors in Thailand in order to examine whether the results were different in terms of the different industrial sectors. The empirical results of the effect of firm financial constraint on investment are shown in Table 3 for the different GMM estimations. Table 3 shows that the effect of firm financial constraint on investment is different among the industrial sectors. The coefficient of cash flow to capital ratio still had a significant positive effect on firm investment and this effect was relatively high in the customer goods sector with a coefficient of 1.53, followed by the industrial sector, natural resources, technology, real estate and construction, the agricultural and food industry, and the service sector, with a coefficient of 0.008. These results showed that the effect of financial constraint on firm investment can vary depending on the financial condition in each industrial sector. From Table 1, panel B, the lowest ratio of cash flow to capital was in the firms in the customer goods sector (about 1.21), while the highest ratio was in the service sector (about 18.72). This was followed by the agricultural and food industry, technology, real estate and construction, industrial goods, and natural resources (1.94). This shows that the effect of financial constraint on firm investment will become higher particularly in firms with a weaker balance sheet condition or in more financially constrained firms which have a relatively low cash flow to capital ratio. According to Gaiotti and Generale (2001) and Oliner and Rudebusch (1996), this is because these firms have a lower liquidity condition and thus higher external funding costs, relative to firms with a better balance sheet condition. This therefore increases their dependence on internal finance and raises the effect of firm cash flow on investment. Regarding the effect of the firm leverage ratio on firm investment, the results in Table 3 show that the coefficient of debt to capital ratio remained significantly negative, especially for the real estate and construction sector at about −0.025, followed by the industrial goods sector, natural resources, the consumer goods sector, technology, the agricultural and finally by the food industry sector and service sector, which had the lowest value (−0.0002). From Table 1, panel B, the leverage ratio of the firms in the real estate and construction sector was the highest at 14.33, while in the service sector it was the lowest at 2.27. This ratio was followed by the industrial goods sector, natural resources sector, consumer goods industry, agricultural and food industry, and technological industry at 2.63. Thus, the effect of the firm leverage ratio on firm investment will become greater in firms with a weaker balance sheet condition, as such firms have a relatively high leverage ratio because higher firm leverage will result in greater financial constraint in terms of a higher default risk, causing difficulties for firms to find external funds (Agung et al., 2002; Guariglia, 1999). As a result, these firms need to depend more on their internal funds and there is a more

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Table 3
Effect of firm financial constraint on firm investment after dividing the sample into different industrial sectors (First Difference-GMM estimation)

Variable/Industrial sector	Agriculture and food	Natural resources	Technology	Services	Industrial goods	Consumer goods	Real estate and construction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM
(I/K)							
(t-1)	1.4598***	1.2367***	1.1971**	1.0422***	1.9674***	0.6021***	0.5183***
	(0.2256)	(0.1469)	(0.5245)	(0.2664)	(0.8016)	(0.2076)	(0.0513)
(t-2)	−0.2618	2.1848***	−0.1771	−0.0487	1.1586	0.0522	1.1614***
	(0.1972)	(0.4339)	(0.2621)	(0.1438)	(1.1227)	(0.0792)	(0.4362)
(t-3)	0.2694***	−0.8258	0.5602*	0.2948***	0.2288	−0.0072	0.9600***
	(0.0657)	(0.6072)	(0.3264)	(0.0712)	(1.5996)	(0.1404)	(0.2636)
(t-4)	0.0779*	0.1692	0.4145	0.0922	2.0104***	−0.0769	0.3912**
	(0.0461)	(0.2785)	(0.4225)	(0.0556)	(0.7812)	(0.1228)	(0.1781)
$(I/K)^2$							
(t-1)	−0.0242***	−0.0023***	−0.0018	−0.0025	−0.0026**	−0.0169	0.0001
	(0.0059)	(0.0006)	(0.0036)	(0.0020)	(0.0011)	(0.0134)	(0.0001)
(t-2)	0.4465	−0.0043***	0.0007	0.0015	−0.0004	0.0038	−0.0001***
	(0.4548)	(0.0001)	(0.0016)	(0.0010)	(0.0014)	(0.0038)	(0.0001)
(t-3)	0.2091	−0.3719	−0.0033*	−0.0026***	−0.0003	0.0068	−0.0006***
	(0.1698)	(0.3716)	(0.0019)	(0.0001)	(0.0004)	(0.0114)	(0.0001)
(t-4)	−0.0034***	−0.1099***	−0.0054**	−0.0033**	−0.0009***	−0.0095*	−0.0004***
	(0.0011)	(0.2938)	(0.0024)	(0.0014)	(0.0001)	(0.0053)	(0.0001)
(Y/K)							
(t-1)	0.0131*	−0.1557	0.0813	0.0171	−0.1899	−0.0416	0.0777
	(0.0065)	(0.2698)	(0.1134)	(0.0241)	(1.4105)	(0.0365)	(0.1369)
(t-2)	0.0107*	−0.3731	0.0569	−0.0077	−1.8129	0.0481*	−0.3192
	(0.0055)	(0.3716)	(0.0887)	(0.0089)	(2.0323)	(0.0272)	(0.2932)
(t-3)	0.0119*	0.0022**	0.0365	−0.0003	−0.5492	0.0591**	0.1537*
	(0.0059)	(0.0001)	(0.0693)	(0.0197)	(0.6704)	(0.0286)	(0.0807)
(t-4)	0.0077*	0.0009***	0.0702	−0.0017	−0.0261	0.0538**	0.2462*
	(0.0042)	(0.0002)	(0.1029)	(0.0086)	(0.4180)	(0.0251)	(0.1247)
(C/K)							
(t-1)	−0.0401	0.3757*	−0.5900	0.0785	0.5131**	−0.2974	0.3062***
	(0.0329)	(0.1926)	(0.6467)	(0.0921)	(0.2547)	(0.2303)	(0.0991)
(t-2)	0.0141**	0.3140	1.4075	0.0141***	−1.107	1.5369***	0.3694**
	(0.0078)	(0.3841)	(0.9812)	(0.0047)	(1.0720)	(0.2284)	(0.1635)
(t-3)	−0.0848	0.1949	0.4166***	0.0083***	−0.4154	0.4931	−0.1583
	(0.0621)	(0.1531)	(0.1377)	(0.0017)	(0.3155)	(0.5072)	(0.1068)
(t-4)	0.0452*	0.4521	0.2224	−0.2061	−0.6511	0.9718***	0.2871**
	(0.0244)	(0.5875)	(0.2521)	(0.1569)	(0.9141)	(0.2938)	(0.1091)
$(D/K)^2$							
(t-1)	0.0000	0.0040	−0.0016	−0.0001	−0.0431*	−0.0009	−0.0251***
	(0.0006)	(0.0030)	(0.0028)	(0.0001)	(0.0230)	(0.0005)	(0.0039)
(t-2)	−0.0005***	0.0062	−0.0016	−0.0002**	−0.0185**	−0.0009*	−0.0103
	(0.0002)	(0.0190)	(0.0019)	(0.0001)	(0.0071)	(0.0003)	(0.0223)
(t-3)	0.0012	−0.0031	−0.0032**	0.0001	−0.0004	0.0001	−0.0024
	(0.0007)	(0.0003)	(0.0014)	(0.0000)	(0.0011)	(0.0005)	(0.0049)
(t-4)	0.0004	−0.0036**	−0.0023	0.0000	−0.0074***	−0.0007	−0.0145***
	(0.0003)	(0.0016)	(0.0021)	(0.0001)	(0.0022)	(0.0007)	(0.0028)
Hansen test	115.28	196.55	200.34	75.95	99.58	25.14	83.14

Notes: Estimation using First Difference-GMM estimation (GMM). I/K is the ratio of firm investment to capital in which I is calculated from $I_t = K_t - K_{t-1} + DEP_t$, where K is the net fixed assets and DEP is the depreciation. Y/K is the output to capital stock ratio, C/K is the cash flow to capital stock ratio, and D/K is the debt to capital ratio. Symbols *, **, *** indicate that a coefficient is statistically significant at levels of 10%, 5%, and 1%, respectively.

pronounced effect of the firm leverage on firm investment in the more financially constrained firms than the less financially constrained ones.[2]

Table 3 present the results of the effect of financial constraint on firm investment after dividing the sample into different industrial sectors shown in Columns (1)–(7).

The empirical results for the effect of financial development on firm investment when dividing the sample into different industrial sectors shows that the effect of financial development on firm investment varies according to the industrial sector. From Tables 4 and 5, using the First Difference-GMM estimation,[3] the coefficients of $(C/K) \times$ FD1 and $(C/K) \times$ FD2 were still significantly negative and relatively high in the industrial goods sector, at about −0.31 and −0.49, respectively, followed by the natural resource industry, consumer goods, real estate and

[2] The results from System-GMM estimation were also similar to those using the First Difference-GMM estimation.

[3] The results from the System-GMM estimation were also similar to those using First Difference-GMM estimation.

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Table 4
Effect of financial development in terms of size (FD1) on firm investment after dividing the sample into different industrial sectors (First Difference-GMM estimation)

Variable/ industrial sector	Agriculture and food	Natural resources	Technology	Services	Industrial goods	Consumer goods	Real estate and construction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM
(I/K)							
(t-1)	−2.4266	−0.1514	0.3583	−0.0379	1.6667***	0.0726**	0.8565***
	(1.5947)	(0.4098)	(0.4044)	(0.0859)	(0.6264)	(0.2972)	(0.2663)
(t-2)	−1.0146	−0.4675	0.8352**	0.2474***	0.7519***	0.0768	−0.0291
	(0.9532)	(0.4451)	(1.4009)	(0.0623)	(0.2591)	(0.1290)	(0.1638)
(t-3)	−0.8926	0.4605	−0.3904	−0.0137	−0.8681**	0.0111	0.5364***
	(0.6643)	(0.4594)	(0.3277)	(0.0812)	(0.4082)	(0.1404)	(0.1391)
(t-4)	−2.1852*	1.0189***	−0.4517	0.0249	−0.8915	0.3884***	0.1202
	(1.1347)	(0.3235)	(0.7264)	(0.2501)	(0.5773)	(0.1265)	(0.1291)
$(I/K)^2$							
(t-1)	−1.4230	−0.0001	0.0021	−0.0018	−0.0552**	−0.0308*	−0.0032**
	(1.0738)	(0.0011)	(0.0024)	(0.0018)	(0.0145)	(0.0156)	(0.0014)
(t-2)	−1.0789	−0.0034**	−0.0055***	0.0019	0.0222*	0.0092	−0.0004
	(1.0577)	(0.0012)	(0.0021)	(0.0011)	(0.0127)	(0.0066)	(0.0024)
(t-3)	−0.8838	−0.0008	0.0014	−0.0031***	−0.0267	−0.0149*	−0.0030
	(0.9602)	(0.0009)	(0.0019)	(0.0011)	(0.0161)	(0.0078)	(0.0025)
(t-4)	0.2730	−0.0001	0.0003	−0.0021	−0.0231	−0.0093*	0.0027
	(0.5549)	(0.0001)	(0.0037)	(0.0024)	(0.0148)	(0.0054)	(0.0019)
(Y/K)							
(t-1)	0.2729**	0.0938*	−0.0671	−0.0022	0.0363***	−0.0011	0.9748**
	(0.1247)	(0.0525)	(0.1120)	(0.0151)	(0.0120)	(0.0584)	(0.4778)
(t-2)	0.1893*	0.2013	−0.0312	0.0038	−0.0115	−0.0387	0.8731*
	(0.9609)	(0.2273)	(0.0577)	(0.0144)	(0.0347)	(0.0461)	(0.4643)
(t-3)	0.2275**	−0.1644	0.0149***	0.0276***	−0.0128	−0.03897	0.3734
	(0.1074)	(0.2078)	(0.0061)	(0.0101)	(0.0250)	(0.0491)	(0.3025)
(t-4)	0.1708*	−0.1140	−0.0353	0.0133**	0.0097	−0.0386	0.5488
	(0.9929)	(0.1493)	(0.0607)	(0.0059)	(0.0100)	(0.0460)	(0.3853)
(C/K)							
(t-1)	1.0743	1.2071**	1.2615	0.4034**	−1.0336	1.8409**	0.0284
	(1.6215)	(0.4989)	(1.9525)	(0.1980)	(1.3163)	(0.9513)	(3.5401)
(t-2)	1.4865	1.2180	1.0349**	−0.0305	0.1475	1.1148	−1.7366
	(1.3561)	(0.9045)	(0.5658)	(0.0555)	(1.6551)	(1.5383)	(2.3527)
(t-3)	0.8410**	0.4215	1.6189	0.03566	1.7306***	−1.4932	0.4384
	(0.4697)	(0.4327)	(1.8417)	(0.2854)	(0.6324)	(4.7226)	(2.7712)
(t-4)	1.0105	−0.0027	1.9243	−0.0661	−1.692	−4.0590	1.0784***
	(0.6294)	(0.0528)	(1.1521)	(0.1669)	(1.3412)	(3.2918)	(0.5746)
$(D/K)^2$							
(t-1)	−0.0202***	−0.0393	0.0426	−0.0069	0.5210	0.0031	−0.9008**
	(0.0073)	(0.0488)	(0.0299)	(0.0174)	(0.4739)	(0.0035)	(0.3621)
(t-2)	−0.0160***	−0.0935*	−0.0065	−0.0146**	−0.0519	−0.0021	−0.1663
	(0.0049)	(0.0525)	(0.0134)	(0.0063)	(0.0808)	(0.0023)	(0.2557)
(t-3)	0.0156	−0.0321	−0.0237	−0.0063	0.1074	0.0003	−0.6886
	(0.0181)	(0.0376)	(0.0184)	(0.0151)	(0.0865)	(0.0006)	(0.4161)
(t-4)	−0.0006	−0.0676**	−0.0197*	0.0048	−0.1927*	−0.1125*	−1.5986*
	(0.0017)	(0.0292)	(0.0113)	(0.0072)	(0.1113)	(0.0560)	(0.9272)
$(C/K) \times FD1$							
(t-1)	0.0107*	−0.0001	−0.0021	−0.0020**	−0.3151*	−0.0676*	0.0071
	(0.0059)	(0.0451)	(0.0408)	(0.0010)	(0.1798)	(0.0343)	(0.0195)
(t-2)	0.0021	−0.1129*	−0.0395*	0.0001	0.2268	−0.0706	0.0136
	(0.0082)	(0.0605)	(0.0290)	(0.0002)	(0.2387)	(0.0485)	(0.0126)
(t-3)	−0.0263***	−0.0098	0.0029	−0.0018	−0.0233	0.0084	−0.0233
	(0.0073)	(0.0489)	(0.0414)	(0.0015)	(0.0720)	(0.0287)	(0.0139)
(t-4)	0.0098	−0.0632	−0.0104	0.0002	−0.1666**	0.0032	−0.1028***
	(0.0076)	(0.0561)	(0.0246)	(0.0008)	(0.0773)	(0.0200)	(0.0268)
$(D/K)^2 \times FD1$							
(t-1)	−0.0029	0.0002	−0.0001***	0.0005	0.0048**	0.0000	−0.0002
	(0.0024)	(0.0002)	(0.0000)	(0.0008)	(0.0019)	(0.0001)	(0.0001)
(t-2)	0.0001	−0.0005*	0.0001***	−0.0037**	0.0013	0.0001*	0.0000
	(0.0004)	(0.0002)	(0.0000)	(0.0017)	(0.0011)	(0.0000)	(0.0001)
(t-3)	−0.0006	0.0001	−0.0001*	−0.0006	0.0038**	0.0000	0.0001
	(0.0005)	(0.0002)	(0.0000)	(0.0008)	(0.0021)	(0.0001)	(0.0001)
(t-4)	−0.0012*	−0.0003**	0.0000	−0.0022**	0.0080*	−0.0000	0.0001*
	(0.0006)	(0.0001)	(0.0000)	(0.0011)	(0.0044)	(0.0000)	(0.0001)
Hansen test	227.62	133.65	256.36	79.32	129.79	220.68	116.50

Notes: Estimation uses First Difference-GMM estimation (GMM). I/K is the ratio of firm investment to capital in which I is calculated from $I_t = K_t - K_{t-1} + DEP_t$, where K is the net fix asset and DEP is the depreciation. Y/K is the output to capital stock ratio, C/K is the cash flow to capital stock ratio, and D/K is the debt to capital ratio. FD1 is the combination of the depository banks'assets to total financial assets and stock market capitalization to GDP. Symbols *, **, *** indicate that a coefficient is statistically significant at levels of 10%, 5%, and 1%, respectively.

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Table 5
Effect of financial development in terms of activities (FD2) on firm investment after dividing the sample into different industrial sectors (First Difference-GMM estimation)

Variable/ industrial sector	Agriculture and food	Natural resources	Technology	Services	Industrial goods	Consumer goods	Real estate and construction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM
(I/K)							
(t-1)	1.375***	0.8576	0.5783**	0.9205***	1.2761***	0.8097**	0.7648***
	(0.2179)	(0.5770)	(0.2348)	(0.2773)	(0.4037)	(0.3106)	(0.1890)
(t-2)	−0.3892	1.2313*	1.1209	−0.1258	1.9056*	0.0242	−0.0533
	(0.2397)	(0.6714)	(1.4679)	(0.1519)	(1.0235)	(0.1145)	(0.2103)
(t-3)	−0.0506	0.4591	−0.6219	0.2608***	2.3963**	−0.0144	0.5604***
	(0.1204)	(0.5561)	(0.4649)	(0.0932)	(0.9963)	(0.1481)	(0.1388)
(t-4)	−0.0904	0.2126	−0.4620	0.0302	2.3306	0.4144***	0.0979
	(0.0846)	(0.2221)	(0.7964)	(0.2518)	(1.5566)	(0.1378)	(0.1607)
$(I/K)^2$							
(t-1)	−0.0267***	−0.0002*	0.0005	−0.0017	−0.0029**	−0.0342**	0.0003
	(0.0070)	(0.0013)	(0.0021)	(0.0019)	(0.0013)	(0.0163)	(0.0002)
(t-2)	−0.0163***	0.0016	−0.0064	0.0018	−0.0015	0.0093	−0.0003
	(0.0056)	(0.0017)	(0.0078)	(0.0012)	(0.0014)	(0.0059)	(0.0002)
(t-3)	0.0043	−0.0011	0.0033	−0.0027**	0.0023*	0.0147*	−0.0004**
	(0.0124)	(0.0016)	(0.0027)	(0.0010)	(0.0013)	(0.0078)	(0.0002)
(t-4)	−0.0011	0.0014	−0.0006	−0.0020	−0.0004	−0.0126**	−0.0001
	(0.0017)	(0.0001)	(0.0032)	(0.0026)	(0.0004)	(0.0059)	(0.0001)
(Y/K)							
(t-1)	−0.0644	−0.0166	−0.1041	0.0420*	−0.0782	0.0119	0.9427**
	(0.0428)	(0.2001)	(0.1196)	(0.0248)	(2.0046)	(0.0592)	(0.4478)
(t-2)	−0.0784*	−0.0644	−0.3383	−0.0239	0.1920	−0.0334	0.8435*
	(0.0402)	(0.1649)	(0.0469)	(0.0342)	(0.6740)	(0.0471)	(0.4625)
(t-3)	−0.0827	−0.2839*	−0.0172	−0.0254	0.7949	−0.0331	−0.3303
	(0.0521)	(0.1624)	(0.0403)	(0.0221)	(0.6675)	(0.0491)	(0.2735)
(t-4)	−0.0681*	3.5382	−0.0530	0.0308**	−0.5285	−0.0278	0.5534
	(0.0324)	(0.2585)	(0.0574)	(0.0158)	(0.7742)	(0.0469)	(0.3898)
(C/K)							
(t-1)	1.8369	−1.7314	1.5932	0.7063**	1.2970*	−1.8856	0.8187
	(2.6439)	(0.7846)	(1.4569)	(0.3283)	(0.6942)	(1.7319)	(1.5053)
(t-2)	0.2943	1.1915	1.3035***	0.1733	1.4529	−0.6138	1.1667*
	(1.9805)	(1.1174)	(0.0607)	(0.1719)	(1.6829)	(1.7946)	(0.5545)
(t-3)	−4.5526	1.7935	1.8031	0.9115	2.9536	1.2469***	−0.1912
	(3.1471)	(1.3655)	(1.9542)	(0.8119)	(12.7221)	(0.6140)	(1.1952)
(t-4)	0.8263**	0.0682**	−0.7010	0.02162	2.2673**	1.2552***	1.5229
	(0.4197)	(0.0316)	(1.2436)	(0.6348)	(1.1265)	(0.6584)	(1.0642)
$(D/K)^2$							
(t-1)	0.1285*	0.0039	−0.0078	0.0106	−0.0148***	0.7145	−0.0952
	(0.0718)	(0.0155)	(0.0082)	(0.0422)	(0.0045)	(0.4962)	(0.1262)
(t-2)	−0.2406*	0.0113	0.0042	0.0226	−0.0142***	−0.2064	−0.5441**
	(0.1382)	(0.0092)	(0.0086)	(0.0602)	(0.0047)	(0.1596)	(0.2410)
(t-3)	0.1927	−0.0114**	−0.0063	0.0209	−0.0139**	0.1210	0.0819
	(0.1617)	(0.0059)	(0.0109)	(0.0488)	(0.0058)	(0.0877)	(0.0991)
(t-4)	−0.2378	0.0427	−0.0163	0.0286	0.0015	0.2694	−0.4049**
	(0.1743)	(0.0438)	(0.0247)	(0.0546)	(0.0036)	(0.1638)	(0.1734)
$(C/K) \times FD2$							
(t-1)	−0.0485	−0.0146	0.0188*	−0.0050**	−0.4922*	0.0011	0.0534
	(0.0643)	(0.0199)	(0.0100)	(0.0019)	(0.2546)	(0.0449)	(0.0526)
(t-2)	−0.0122**	−0.0047	0.0074	−0.0011	0.1969	−0.1674*	−0.1155
	(0.0668)	(0.0143)	(0.0111)	(0.0010)	(0.3017)	(0.0958)	(0.0683)
(t-3)	−0.0144	0.0351	−0.0293***	−0.0057	−0.0662	0.0006	−0.0721
	(0.0283)	(0.0237)	(0.0106)	(0.0058)	(0.1248)	(0.0801)	(0.0451)
(t-4)	0.0064	−0.0505**	0.0263**	−0.0012	−0.3648**	−0.0232	−0.0487**
	(0.0454)	(0.0192)	(0.1638)	(0.0043)	(0.1444)	(0.0604)	(0.0215)
$(D/K)^2 \times FD2$							
(t-1)	0.0000	−0.0048	−0.0007*	0.0004	−0.0001	−0.0000	0.0001***
	(0.0001)	(0.0031)	(0.0003)	(0.0001)	(0.0002)	(0.0001)	(0.0000)
(t-2)	−0.0020*	0.0012	−0.0013*	−0.0048**	0.0002**	−0.0000*	0.0001***
	(0.0001)	(0.0011)	(0.0007)	(0.0021)	(0.0001)	(0.0001)	(0.0000)
(t-3)	0.0000	−0.0008	−0.0011	−0.0009	−0.0057	0.0001	−0.0000**
	(0.0001)	(0.0006)	(0.0008)	(0.0008)	(0.0058)	(0.0001)	(0.0000)
(t-4)	0.0001	−0.0010**	0.0011	−0.0035**	−0.0001	−0.0002	−0.0000
	(0.0001)	(0.0005)	(0.0008)	(0.0014)	(0.0003)	(0.0002)	(0.0000)
Hansen test	120.84	154.30	294.45	93.98	194.45	192.01	158.87

Notes: Estimation used First Difference-GMM estimation (GMM). I/K is the ratio of firm investment to capital in which I is calculated from $I_t = K_t - K_{t-1} + DEP_t$, where K is the net fixed assets and DEP is the depreciation. Y/K is the output to capital stock ratio, C/K is the cash flow to capital stock ratio, and D/K is the debt to capital ratio. FD2 is the combination of the private credit by depository banks to GDP ratio and stock market capitalization to GDP. Symbols *, **, *** indicate that a coefficient is statistically significant at levels of 10%, 5%, and 1%, respectively.

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construction industry, technology, agriculture and food industry, and services industry. Moreover, the coefficients of $(D/K)^2 \times$ FD1 and $(D/K)^2 \times$ FD2 were still significantly positive and higher in the industrial goods sector, at 0.008 and 0.0002, respectively, followed by the real estate and construction sector, consumer goods, technology, natural resources, agriculture and food, and the services sector. These results show that the effect of financial development will be higher in the more financially constrained firms than the less constrained ones. The financial condition of firms presented in Table 1, panel B, shows that the firms in the industrial goods sector, consumer goods sector, and natural resources sector have a relatively lower cash flow to capital ratio compared to those in the services sector which have a relatively high cash flow to capital ratio. On the other hand, the firms in the real estate sector and those in the industrial goods sector have a relatively high leverage ratio compared with other firms in the technology and services sector. This financial condition shows that the firms which have more financial constraint will have a relatively low liquidity condition and a higher cost of external funds. As a result, the effect of financial development will lead to a greater opportunity for these firms to obtain external funding sources compared with the less financially constrained ones, which previously had less difficulty in finding external funding sources (Gelos & Werner, 2002; Harris et al., 1994; Laeven, 2003; Love, 2003). Therefore, the effect of financial development in terms of size and activity in the banking and capital market will result in less dependence for firm investment on internal funds or financial condition and this effect will be higher in the more financially constrained firms.

Table 4 presents the results of the effect of financial development in terms of size (FD1) on the way in which financial constraint affects firm investment after dividing the sample into the different industrial sectors shown in columns (1)–(7).

Table 5 presents the results of the effect of financial development in terms of activities (FD2) on the way in which financial constraint affects firm investment after dividing the sample into the different industrial sectors shown in columns (1)–(7).

Conclusion and Recommendation

Study of the relationship between financial constraint, financial development, and firm investment has traditionally been focused on the effect of financial constraint on firm investment, but mainly in developed countries. Therefore, this study aimed to fill the gap by introducing an evidence-based study in Thailand as a case study of a developing Asian country, as well as examining the effect of financial development on the way in which financial constraint affects firm investment, which has rarely been investigated, including in Thailand. The paper examined the effect of financial constraint and financial development on firm investment using data from non-financial companies in Thailand from 1999Q1 to 2015Q4. The results showed a significant effect of firm financial constraint on firm investment. The firm cash flow had a positive effect on firm investment, while the firm leverage ratio had a negative effect. Financial development also weakened the effect of firm financial constraint on firm investment, and the effects were considerably higher in the more financially constrained firms than the less constrained ones. The results from the study have some important implications for policies in Thailand. As we found that the financial constraint of firms can affect firm investment, firms and investors should consider financial structure and condition as important factors in their investment decision. Risk management of firms should be improved in order to be well prepared to prevent the possible occurrence of financial and economic risks, particularly for the more financially constrained firms. In addition, due to the significant effect of financial development on the way financial condition or constraint of firms affect firm investment, policymakers should consider these effects when preparing new financial development plans in the future (2016–2020). As this study focused on a case study in Thailand, future study of this topic could consider a group of developing countries, such as the ASEAN countries, in order to obtain results covering other developing countries. Furthermore, further research could extend to studying the effect of other aspects of financial development, such as financial competition and financial liberalization, on firm investment.

Conflict of Interest

The author declares no conflict of interest.

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