Information disclosure and SME financing: A study of firms in the ASEAN region

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Abstract

This study investigates the impact of information and communication technology (ICT) and audited financial statements on small and medium enterprise (SME) financing, as well as their influence on SMEs' collateral issues in acquiring bank loans, based on the information asymmetry theory. The study applies the ordinary least squares (OLS) test, the two-stage least squares test, and the probit regression model for the analysis. The sample consists of 12,165 firms in eight ASEAN countries between 2009 and 2018. The data used in the analysis was sourced from the Business Environment and Enterprise Performance Surveys (BEEPS) provided by the World Bank. The results reveal that financial statements and ICT have a positive relationship with SMEs' bank credit accessibility and a negative relationship with collateral issues faced by SMEs in accessing bank loans. Thus, SMEs that use financial statements and ICT have more financing opportunities than those that don't. The impacts of financial statements and ICT are stronger in counties with a more developed financial infrastructure. Additionally, this study found that economic development enables SMEs to access cheaper finance and mitigate collateral problems. These outcomes contribute to the enhancement of SME financing and promote SMEs' information disclosure in the ASEAN region. Promoting SMEs' information disclosure is also crucial for banks in mitigating bad debt. Therefore, encouraging and supporting SMEs to adopt financial statements and ICT can be beneficial to both SMEs and banks.

1. Introduction

Small and medium enterprises (SMEs) play a vital role in the Association of South East Asian Nations (ASEAN), accounting for over 92% of the total number of enterprises and contributing an average of over 69%

to total employment and a 41% share in the ASEAN region's GDP during 2010–2019 (Asian Development Bank, 2020). Table 1 illustrates the significant economic contributions of SMEs in ASEAN countries. Despite their significance, the World Bank's Enterprise Surveys (2007–2018) indicate that firms in ASEAN countries face several challenges, including poor business infrastructure, financial constraints, and an unhealthy legal system. According to OECD/ERIA (2018),[1] financial constraints are more significant for SMEs and hinder firms' innovation and growth opportunities. Previous studies by Central Statistical Organization (Myanmar) and United Nation University-Wider (2018); Kyophilavong (2011); Myint (2020) and Shinozaki (2012) show the adverse impact of financial constraints on SMEs' survival and growth. Thus, financial constraints can have a significant indirect impact on a country's industrialization and socioeconomic development. Consequently, SMEs' financing is a major concern for governments in ASEAN countries.

Table 1. Contributions of SMEs to ASEAN countries' economy.

Serial number	Country	SMEs' share of total businesses (%)	SMEs' share of total employment (%)	SMEs' share of GDP (%)	Surveyed Year
1	Singapore	99.5	75.4	44.7	2019
2	Brunei	97.2	57.3	–	2017
3	Malaysia	97.2	48.0	38.2	2020
4	Thailand	99.5	71.7	34.2	2020
5	Indonesia	99.9	96.9	60.5	2019
6	Philippines	99.5	62.8	35.7	2020
7	Vietnam	97.4	37.5	45.0	2016
8	Myanmar	89.9	80.0	Around 36.0	2019, 2016
9	Cambodia	99.8	71.8	–	2014
10	Laos	99.8	82.4	Under 20.0	2013

Source: Yoshino and Taghizadeh-Hesary (2018); Asia SME Monitor dataset, Asian Development Bank (2020).

There are various sources of SME financing, such as bank finance, supplier credit, and equity financing. Banks are the major fund providers for SMEs, with an approximate 80% share in SME credits in Asian and non-Asian countries (ADB–OECD, 2014; OECD, 2020). Bank lending is a sustainable source of funds and is cheaper compared to non-bank financing. However, banks, especially in developing countries, are reluctant to provide finance to SMEs because of information asymmetry and SMEs' risky nature (Beck, Demirgüç-Kunt, & Pería, 2008; Berger & Udell, 2002). Information asymmetry is a situation in which lenders face uncertainty regarding the creditworthiness of borrowers as they cannot access sufficient information relating to the borrowers. This causes adverse selection and moral hazard problems in financial intermediation (Dell' Ariccia, 1998). Information asymmetry discourages banks from lending to SMEs and causes many SMEs with growth potential to face financial constraints (Huang, When, & Liu, 2014). As a result, banks in developing countries apply collateralized lending for firms with inadequate business information. Collateral is the biggest challenge for SMEs in accessing bank credit (Yoshino & Taghizadeh-Hesary, 2018). Banks in the ASEAN region heavily apply collateralized lending for SMEs (Asian Development Bank, 2020). Figure 1 shows the share of bank loans between SMEs and large firms in seven ASEAN countries in 2019. The bank credit ratio for SMEs is much smaller compared to that of large firms.
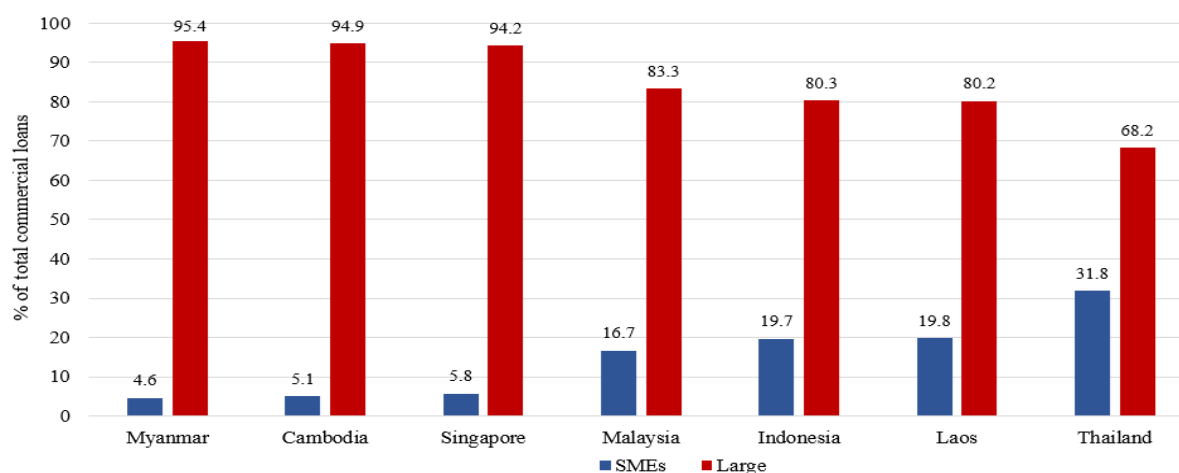

Figure 1. Bank credit rations between SMEs and large firms in the ASEAN countries in 2019.

[1] OECD = Organization for Economic Co-operation and Development; ERIA = Economic Research Institute for ASEAN and East Asia.

Despite there being a wealth of international studies on SME financing, empirical research on SME financing in the ASEAN region is limited. Financing constraints have remained a challenge for SMEs in ASEAN countries. To the best of our knowledge, most of the earlier studies focus on firms' characteristics to examine SME financing and place less emphasis on information problems. With the aim of enhancing cheaper financing opportunities for SMEs, this study examines SMEs' bank financing and their collateral issues in accessing bank credit based on information asymmetry theory.

Information disclosure assists SMEs in acquiring external financing. Financial statements are a tool for collecting SMEs' information, such as business assets, capital and credit information (Bodie, Robert, & David, 2009). ICT adoption makes firms' information more transparent (Dalla, Frazzoni, Rotondi, & Vezzulli, 2017; Mushtaq, Gull, & Usman, 2022). With technology development, many businesses are applying ICT, such as their own email domains and websites, for their business. Thus, banks can access firms' information, such as product information and trading, through their websites. If the creditors properly apply this information for the credit assessment of SMEs, it will enhance the wellbeing of both creditors and SMEs. However, previous studies have not considered the significance of SMEs' financial statements and ICT in the examination of SMEs' financing. From the aspect of reducing information asymmetry between SMEs and banks, this study investigates the impact of financial statements and ICT adoption on SMEs' bank credit accessibility and their influence on SMEs' collateral payment in accessing bank credit. An awareness of the significance of SMEs' financial statements and ICT adoption is vital to their ability to access cheaper finance and also in promoting SME policies.

Section 2 reviews the earlier literature regarding the factors that influence SMEs' financing and contains the formulation of the hypotheses, Section 3 explains the empirical model and the sample data of the study, Section 4 discusses the results of the analyses, and Section 5 summarizes the main findings and draws conclusions.

2. Literature Review

2.1. SME Financing and Information Asymmetry

SME financing constraints are influenced by the supply-side factors of information asymmetry, high risk (uncertainty), high transaction and monitoring costs, and insufficient collateral (Railiene & Ivaskeviciute, 2014). Small firms are more financially constrained than large firms because they cannot show reliable financial information for bank credit evaluation (Berger & Udell, 2002). These studies highlight the significance of SMEs' information to their financing. To reduce the information asymmetry problem, financial institutions apply various tools to evaluate SMEs' credit. Relationship lending is a good technique for banks to provide loans for businesses without enough information (Berger & Udell, 2002). Trust created through the firm–bank relationship is efficient in reducing information asymmetry between firms and banks and the cost of financing SMEs (Fidrmuc, Schreiber, & Siddiqui, 2015; Howorth, 2012). In the United Kingdom, owners'/managers' financial literacy enhances SMEs' access to finance through the preparation of financial statements and a reduction in information asymmetry (Hussain, Salia, & Karim, 2018). Thus, firm–bank relationships and owners'/ managers' financial literacy can assist SMEs in improving their financing.

Various factors influence the assessment of SME loans under information ambiguity. In Vietnam, the net worth of business owners and the year of establishment influence SMEs' access to bank loans (Vo, Cuong, Dung, & Chieu, 2011). In Laos, the net worth of the largest shareholder, the improvement of business process, and domestic ownership have a positive effect on SME financing (Kyophilavong, 2011). For manufacturing SMEs in Myanmar, firm size, firm age and legal status reduce SMEs' credit constraints (Central Statistical Organization (Myanmar) and United Nation University-Wider, 2018). Collateral, firm size, accepting a bank's clauses, and having a close relationship with a bank have a positive effect on the approval of bank loans, while SMEs' financial ability (net profit, income, asset-to-debt ratio, and credit score) does not have any obvious effect on accessing bank credit in Chengdu City, China (Zhao, Wu, & Chen, 2006). A firm's characteristics (age, size, assets), financial characteristics (financial information, collateral, interest rates, and loan repayment), and the owner's education strongly influence access to bank loans in Bangladesh (Chowdhury & Alam, 2017). Firm size, firm innovation, and interest rates positively influence the amount of credit (Rahman, Belas, Kliestik, & Tyll, 2017).

In accessing SMEs' information, 45% of banks in developing countries use credit reporting systems, but the financial data and credit history of SMEs are inadequate in some countries, including ASEAN countries (World Bank, 2014). Financial infrastructure, such as a credit information systems, credit bureaus, and credit guarantee systems, are in the early stage of implementation in some ASEAN countries, such as Laos, Myanmar, and Cambodia (OECD/ERIA, 2018). The earlier literature highlights the information asymmetry problems between financial institutions and SMEs. The problems bring high financing costs and difficulties in accessing finance for SMEs with inadequate collateral. Due to the lack of information, the credit rationing of financial institutions is biased in favor of large and more established firms. Firm type, collateral and firm innovation have become tools used by financial institutions to resolve information asymmetry problems in SME lending.

2.2. Audited Financial Statements and SMEs' Information

Financial statements can reduce information asymmetry for both SMEs and financial institutions. Based on balance sheets and income statements, financial institutions make credit evaluations and perform credit scoring, which are necessary for financial statement lending and asset-based lending (Berger & Udell, 2002). Financial statements provide information about a firm's past and present financial performance. However, most SMEs lack audited financial statements as they do not need to report financial and business information to stakeholders. To obtain credit, SMEs need to improve their information provision through proper bookkeeping and auditing their accounts (Kung & Gabriel, 2011).

As SMEs' financial information can be collected from financial statements, SMEs with audited financial statements will improve their information expression and gain access to finance. Furthermore, collateral demanded by financial institutions can be reduced by providing information of the SME's status. However, Rahman, Rahman, and Belas (2017) discovered that audited financial statements do not have a significant effects on collateral requirements in SME financing in Visegrád countries (Czechia, Hungary, Poland and Slovakia). On the other hand, based on a survey of eleven financial institutions, Machmud and Huda (2011) concluded that SMEs need some assistance to improve their capacity building, such as preparing business plans and developing standard accounting operating procedures and cash management systems, to access bank credit. Similarly, Htin Lin Aung (2018) found that banks deny providing loans to SMEs because of the lack of proper accounts, financial statements and a solid business plan. In contrast, when making credit decisions, financial institutions in Myanmar perceive that the quality of financial statements are not reliable. As a result, banks evaluate the qualitative information based on borrowers' businesses and amount of collateral rather than financial analysis (Japan International Cooperation Agency, 2017). Thus, there are differing opinions on the significance of financial statements to SME financing.

Many previous studies highlight the lack of financial statements as one of the barriers that SMEs face regarding access to credit. However, we could not find any empirical studies that examine the significance of financial statements to SMEs' access to bank credit in the ASEAN region. SMEs' accounting development will have some effect on their financing. Additionally, financial statements will influence collateral requirements for loans through providing information, such as business performance and assets. Thus, we construct the following hypothesis based on this assumption:

H1: Financial statements have a significant positive effect on SME financing and a significant negative effect on collateral requirements for SMEs' access to bank credit.

2.3. ICT Adoption and SME Information

ICT enhances the performance of financial institutions through cost reduction and innovation and the development of products and services. However, the supply and demand sides of financial services need to adopt ICT to further the development of the financial sector (Moubarak, 2020). According to a survey of 5,245 SMEs in Japan, ICT adoption has a positive significant effect on a firm's profitability and innovation (Morikawa, 2004). Profitability encourages firms to access more credit and enhances the possibility of credit achievement (Kyophilavong, 2011; Ung & Hay, 2011). Therefore, SMEs' ICT adoption can contribute to their credit viability through enhancing business performance.

ICT enhances lenders' access to borrowers' information. ICT adoption improves the credit availability of small firms through enhancing the information disclosure of firms (Dalla et al., 2017). The ICT adoption and innovation of SMEs have a significant positive effect on their access to bank credit in 149 countries (Mushtaq et al., 2022). ICT adoption eases information asymmetry problems between SMEs and credit suppliers. Reducing information asymmetry can lower the incidence of collateral among SMEs (Rahman, Belas, et al., 2017). Hence, ICT may not only enhance financing but can also reduce collateral demanded by credit suppliers. However, to the best of our knowledge, the role of ICT adoption in solving collateral problems has not caught the attention of researchers. We therefore construct the following hypothesis based on this concept:

H2 ICT adoption has a significant positive effect on SME financing and a significant negative effect on collateral requirements for SMEs' access to bank credit.

3. Empirical Model and Data

3.1. Empirical Model

Based on the theory of information asymmetry, this study investigates the effects of SMEs' accounting and ICT development on their bank credit accessibility and collateral requirements for accessing bank loans.

$$Credit\_{avail_{ijt}} = \alpha + \beta_1 FSs_{ijt} + \beta_2 ICT_{ijt} + \beta_3 LogFirm\_age_{ijt} + \beta_4 LogFirm\_size_{ijt} +$$
$$\beta_5 Sales\_growth_{ijt} + \beta_5 Fin\_dev_{jt} + \beta_6 GDP\_pc_{jt} + \varepsilon_i \quad (1)$$

$$Collateral_{ijt} = \alpha + \beta_1 FSs_{ijt} + \beta_2 ICT_{ijt} + \beta_3 LogFirm\_age_{ijt} + \beta_4 LogFirm\_size_{ijt} +$$
$$\beta_5 Sales\_growth_{ijt} + \beta_5 Fin\_dev_{jt} + \beta_6 GDP\_pc_{jt} + \varepsilon_i \quad (2)$$

$Credit_{-avail_{ijt}}$ represents the bank credit availability of firm i in country j at time t. Equation 1 (Model 1) examines the effects of SMEs' financial statements and ICT adoption on their bank credit accessibility, and Equation 2 (Model 2) investigates the influences of SMEs' financial statements and ICT on the collateral requirements based on cross country firm-level data. The main outcome variables are a firm's bank credit availability and its collateral issues. A firms' bank credit viability is measured by the sum of two dummy variables: a value of 1 is given for a firm that has achieved a bank loan and overdraft, and 0 otherwise. The study applies OLS regression for Equation 1. In Equation 2, collateral issues represent a firm's collateral payment that is decided based on whether a firm is required to pay collateral to acquire bank credit or not. It is expressed by a dummy variable; a value of 1 denotes the requirement of collateral for a bank loan, while a value of 0 signifies the absence of such a requirement. Since collateral is a binary dummy variable, the study uses the probit regression for Equation 2.

Table 2. Explanation of variables.

Variables		Explanation	Sources
Dependent variables			
(i)	Bank loan	Dummy variable, 1 if a firm has a bank loan or line of credit, and 0 otherwise.	BEEPS
(ii)	Bank overdraft	Dummy variable, 1 if a firm has an overdraft account, and 0 otherwise.	BEEPS
1	$Credit_{avail}$	Firm's bank credit accessibility measured by the sum of (i) and (ii)	
2	$Collateral$	Dummy variable, 1 if a firm needs to pay collateral to access bank loans, and 0 otherwise.	BEEPS
Main independent variables			
H1	Audited financial statements	Dummy variable, 1 if a firm has audited financial statements, and 0 otherwise.	BEEPS
(i)	Email	Dummy variable, 1 if a firm uses email in their business communications, and 0 otherwise.	BEEPS
(ii)	Website	Dummy variable, 1 if a firm has a website used for sales and business promotion, and 0 otherwise.	BEEPS
(iii)	Technology license	Dummy variable, 1 if a firm has a technology license, and 0 otherwise.	BEEPS
H2	ICT	ICT development is decided based on the sum of (i), (ii) and (iii).	
Covariates			
(i)	$LogFirm\ age$	A firm's age is decided by the years of business operation. To simplify the results, the data was converted to a logarithmic scale.	BEEPS
(ii)	$LogFirm\ size$	A firm's size is measured by its number of full-time employees. Data was converted into a logarithmic scale.	BEEPS
(iii)	$Sales\_Growth$	Sales growth expresses a firm's profitability or growth. It is calculated by (Previous year's sale value – Sale value of last three years) *100 / Sale value of last three years.	BEEPS
(iv)	Fin_{dev} (*financial development*)	A country-level variable measured by the credit creation of commercial banks per year as a percentage of GDP.	IMF, FAS
(v)	$LogGDP_{pc}$ (*GDP per capita*)	Country-level variable that represents the size of a country's economy.	WDI

Note: BEEPS = Business environment and enterprise performance survey, IMF = International monetary fund, FAS = Financial access statistics, WDI = World development indicators.

Both models contain two sets of covariates: (i) individual firm characteristics (firm size, firm age, and sales growth), and (ii) country level covariates (financial development and economic development—Fin_dev and GDP_pc). A firm's age and size determine its access to bank loans (Chowdhury & Alam, 2017). Furthermore, a firm's age and size can influence its collateral payment in accessing bank loans (Chakraborty & Hu, 2006; Menkhoff, Neuberger, & Suwanaporn, 2006; Rahman, Rahman, et al., 2017). Sales growth represents a firm's profitability and mitigates the likelihood of collateral requirements (Ghozali & Handriani, 2018). Consequently, through reducing collateral issues, a firm's sales growth can assist in accessing finance easily. Therefore, this study includes firm age, firm size, and sales growth as covariates. Additionally, to identify the differences in individual countries' characteristics, the country level covariates were added to the models. Table 2 provides the detailed explanations of the measurement of the variables applied in both models.

3.2. Data

The data used for the analysis was collected from the Business Environment and Enterprise Performance Survey (BEEPS) dataset provided by the World Bank. The BEEPS provides data on firms' access to credit,

collateral requirement for loans, the application of ICT, characteristics (age, size, and sales growth) and possession of audited financial statements. Financial sector development and GDP per capita were taken from the International Monetary Fund's Financial Access Survey (FAS) and the World Development Indicators (WDI) datasets, respectively. Since the firm-level survey data for Singapore and Brunei were not available, the data used consists of 12,165 firms across eight ASEAN countries (Laos, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam). The surveyed countries and years are different: Laos (2012, 2016, 2018), Cambodia (2016), Indonesia (2010, 2015), Malaysia (2015), Myanmar (2014, 2016), the Philippines (2009, 2015), Thailand (2016), and Vietnam (2010, 2015). Since the data includes both SMEs and large enterprises, the study separates these based on the BEEPS business classification. The BEEPS classifies firms with less than one hundred full-time employees as SMEs and firms with 100 or more full-time employees as large enterprises.

4. Findings

4.1. Descriptive Statistics

In the ASEAN region, 92.2% of SMEs in the sample are formal firms, 56.9% use ICT, and only 33.7% possess audited financial statements. According to the data for all firms in Table 3 column 7, the percentage of firms using ICT (65.4%) is slightly higher than that of the world average figure (64.2%). However, the percentage of SMEs using ICT is low compared to that of large firms, meaning that SMEs need to promote the application of ICT. The rate of firms that keep financial statements is 39.9%, which is lower than that of the world average figure of 46.1%. Auditing or maintaining business accounts in the sampled ASEAN countries seems to be underdeveloped. This finding shows that a major portion of SMEs lack audited financial statements and hinder banks and other financial institutions from collecting reliable information for lending purposes or providing other financial services. Consequently, inadequate information will result in higher loan evaluation costs and discourage lending to SMEs.

Table 3 shows the characteristics of SMEs in the ASEAN region compared to those of large firms. The sample includes 9,253 SMEs and 2,912 large firms. A total of 68.3% of the sampled SMEs applied for loans. Only half (50.4%) of SME loan applications were successful, whereas 72.2% of large firms achieved loans. SMEs' financial constraints are always greater than large firms in both developing and developed countries. Approximately 78.7% of SME finance needs collateral, but there is no significant difference between SMEs and large firms in terms of the collateral requirement in accessing bank credit as 75.2% of large firms' finance is also collateralized.

Table 3. Firm characteristics in eight ASEAN countries.

Characteristic	SMEs		Large firms		All firms		World average for all firms
	Quantity	%	Quantity	%	Quantity	%	
1	2	3	4	5	6	7	8
Number of firms	9253	76.1	2912	23.9	12165	100.0	
Number of firms that applied for loans	6322	68.3	2281	78.3	8603	70.7	50.5
Firms that can access finance	3184	50.4	1646	72.2	4830	56.1	64.6
Firms that are required to have collateral to access loans	1981	78.7	956	75.2	2937	77.5	75.0
Formal firms	8529	92.2	2859	98.2	11388	93.6	89.3
Firms using ICT	5262	56.9	2692	92.5	7954	65.4	64.2
Firms with audited financial statements	3113	33.7	1735	59.6	4848	39.9	46.1

The percentage of firms that achieved bank loans in the ASEAN region is 56.1%, which is 8.5% lower than that of the BEEPS' world average figure of 64.6%. A total of 77.5% of loan approvals need collateral, which is slightly higher than the world average percentage of 75% of collateralized loans. Regarding the data for individual countries, SMEs' collateralized loan ratio is the largest in Myanmar (96.8%), followed by Vietnam (95.9%), Laos (92.9%), Indonesia (90.4%), Thailand (77.9%), Cambodia (76.1%), Malaysia (50.0%), and the Philippines (62.7%). These figures explain the larger collateral challenges of SMEs in Myanmar, Vietnam, Laos, and Indonesia, compared to those in Malaysia and the Philippines. The need for collateral in accessing bank loans causes lower access to bank credit for SMEs in these countries, which can be proven by SMEs' access to finance rates, which is the lowest in Myanmar (28.5%) and the largest in Malaysia (68.7%). The ratios of SMEs using ICT and financial statements are very low in Myanmar at 23.4% and 13.6%, respectively, compared to that of the Philippines (79.5% and 82.6%) and Malaysia (70.1% and 55.7%). The use of ICT and

financial statements may contribute to the improvement of financing opportunities for SMEs in Malaysia and the Philippines.

Table 4. Summary statistics of variables.

Variable	Number of observations	Mean	Standard deviation	Min.	Max.
SMEs					
Bank loan	8,341	0.1562	0.4543	0	1
Bank overdraft	8,647	0.2911	0.3631	0	1
$Credit_{avail}$	6,322	0.6020	0.6606	0	2
$Collateral$	2,400	0.8254	0.3797	0	1
$Audited\ financial\ statements$	8,900	0.3494	0.4768	0	1
Email	8,895	0.5391	0.4985	0	1
Website	9,167	0.2837	0.4508	0	1
Technology license	5,772	0.0989	0.2986	0	1
ICT	9,253	0.8610	0.8684	0	3
$Log\_firm\ size$	9,218	1.2041	0.3882	0	1.9956
$Log\_firm\ age$	9,082	1.1040	0.3202	0	2.1106
Sales growth	7,467	31.3693	112.84	-100.00	933.964
$Fin_{dev}\ (financial\ development)$	9,253	49.34	35.41	10.193	119.679
$Log\_GDP_{pc}\ (GDP\ per\ capita)$	9,253	3.4178	0.2449	3.0673	4.0110
Large enterprises					
Bank loan	2,615	0.3254	0.4686	0	1
Bank overdraft	2,612	0.4866	0.4999	0	1
$Credit_{avail}$	2,281	0.9268	0.6915	0	2
$Collateral$	1,188	0.8039	0.3972	0	1
$Audited\ financial\ statements$	2,785	0.6230	0.4847	0	1
Email	2,882	0.8994	0.3009	0	1
Website	2,901	0.6556	0.4752	0	1
Technology license	2,257	0.2548	0.4358	0	1
ICT	2,910	1.7412	0.7919	0	3
$Log\_firm\ size$	2,897	2.4255	0.3879	2	4.3010
$Log\_firm\ age$	2,862	1.2227	0.3013	0	2.2095
Sales growth	2,389	28.3017	103.73	-99.94	934.483
$Fin_{dev}\ (financial\ development)$	2,912	57.43	37.63	10.193	119.679
$Log\_GDP_{pc}\ (GDP\ per\ capita)$	2,912	3.4616	0.2577	3.0673	4.0110

Note: See Table 2 for the definitions of the variables.

Table 4 illustrates the summary statistics of firm characteristics. All the mean values of SMEs are lower than those of large firms. Both SMEs and large firms access bank loans or overdrafts. Overdraft loans can help SMEs to solve their shortage of cash flow or working capital. Moreover, most of the banks do not demand collateral for overdrafts for a limited loan amount. However, the average values of SMEs' loan achievements in both normal bank loans (0.1562) and overdraft loans (0.2911) are lower than that of large firms (0.3254 and 0.4866). Furthermore, the mean values of financial statements and ICT in SMEs are smaller than those of large firms. The developments of the financial sector among the sample countries are much different, with a standard deviation of 35.41%.

4.2. The Estimated Results of Model 1

Table 5 shows the estimated results of Model 1, which examines the relationship between financial statements, ICT and SMEs' bank credit accessibility. The analysis is conducted using two sampling groups: (i) SMEs and (ii) all firms. In the case of the all firms group, the effects of financial statements and ICT on SMEs' finance are investigated using cross-terms: SME_financial statements (financial statements multiplied by SME dummy) and SME_ICT (ICT multiplied by SME dummy). Columns 1 to 3 present the effects of financial statements and ICT on SMEs' bank credit accessibility. The results show significant positive coefficients for financial statements and ICT. The elasticity of financial statements (0.193 in column 1) is larger than that of ICT (0.123 in column 2). When financial statements and ICT are both included, column 3 shows that the coefficient of financial statements is still larger than that of ICT. The coefficients of the other covariates have significant expected signs and are consistent with the findings of previous studies, i.e., firm age, firm size, sales growth, a country's economic development ($Log\ GDP\_pc$), and financial development positively influence SMEs' bank credit accessibility.

According to the classification of the World Economic Outlook [2] (International Monetary Fund, 2022), ASEAN countries can be categorized into two types: low-income developing countries (LIDCs) and emerging market and middle-income economies (EMs). To identify whether there is any difference in bank credit accessibility between these two groups, an *Emerging countries* dummy is added in each estimation. The estimated coefficient is not significant, which implies that there is no significant difference between SME bank financing in EMs and LIDCs.

Columns 4 to 6 show the determinants of all firms' bank financing. The coefficients of financial statements and ICT are significant and positive, and the coefficient of financial statements is larger than that of ICT. The coefficients of SME_financial statements and SME_ICT are both significant and show larger impacts of financial statements and ICT on SMEs' bank financing compared to that of large firms. According to Gujarati and Porter (2009), if independent variables in the regression model correlate with the error terms, the results cannot be reliable. The problem of model specification bias can be caused in the regression. Therefore, the existence of endogeneity is suspected in the OLS regression, and further analyses are conducted to address this.

4.2.1. Solving Endogeneity Concerns

To address possible endogeneity issues in the OLS regression, the study applies two-stage least squares regression. Endogeneity is suspected in the firms' possession of financial statements and uses the firms' registration status as an instrumental variable.[3] The assumption is that financial statements are driven by a firm's registration status and not because of bank credit accessibility. If a firm registers as a type of profit sharing, such as a partnership, joint venture, public listed company, or limited liability company, it may need to keep financial statements for profit sharing purposes. Therefore, the study applies an instrumental dummy variable, with a value of 1 if a firm has a profit sharing status and 0 if it's registered as a sole proprietor or family firm.

Table 5. The impacts of financial statements and ICT on bank credit accessibility.

Independent variable	SMEs			All Firms		
	(1)	(2)	(3)	(4)	(5)	(6)
Audited financial statements	0.193***		0.148***	0.111***		0.090***
	(0.020)		(0.102)	(0.028)		(0.021)
ICT adoption		0.123***	0.102***		0.084***	0.081***
		(0.012)	(0.013)		(0.015)	(0.087)
Log_firm_age	0.118***	0.117***	0.112***	0.101***	0.116***	0.098***
	(0.033)	(0.032)	(0.032)	(0.029)	(0.028)	(0.028)
Log_firm_size	0.315***	0.265***	0.242***	0.254***	0.220***	0.207***
	(0.024)	(0.025)	(0.026)	(0.015)	(0.019)	(0.019)
Sales_growth	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Financial development	0.003**	0.002***	0.002***	0.003***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.0004)	(0.0004)
LogGDP_Pc	0.355***	0.427***	0.423***	0.295***	0.282***	0.344***
	(0.084)	(0.083)	(0.084)	(0.072)	(0.072)	(0.072)
Emerging countries	0.003	−0.008	−0.036	0.067**	0.066**	0.030
	(0.039)	(0.039)	(0.039)	(0.036)	(0.035)	(0.036)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
SME_Acc				0.084***		0.049
				(0.031)		(0.037)
SME_ICT					0.047***	0.027
					(0.014)	(0.017)
Constant	−1.301***	−1.467***	−1.441***	−1.041***	−0.974***	−1.152***
	(0.254)	(0.250)	(0.252)	(0.215)	(0.215)	(0.216)
R-squared	0.1358	0.1443	0.1484	0.1481	0.1526	0.1604
Number of observations	4,962	5,119	4,962	6,800	6,999	6,800

Note: The dependent variable is bank credit accessibility. See Table 2 for the definitions of the variables. Robust standard errors are in parentheses. ** and *** indicate the 5% and 1% levels of significance, respectively.

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[2] The International Monetary Fund World Economic Outlook classifies countries into three groups based on the GDP, total exports of goods and services, and population: (i) advanced economies (AEs), (ii) emerging market and middle-income economies (EMs), and (iii) low-income developing countries (LIDCs). In the ASEAN region, Indonesia, Malaysia, the Philippines, and Thailand are EMs, and Myanmar, Laos, Cambodia, and Vietnam are LIDCs.

[3] To the best of our knowledge, only a few studies examine the role of financial statements in SME financing, but they do not address endogeneity concerns. Thus, this study applies an instrumental variable based on the assumption, which is explained later.

Table 6 illustrates the results of the two-stage least squares regression. The results of all variables for the SME and 'all firms' groups are consistent with the results of the OLS tests. The results of the postestimation tests, the Wu–Hausman and endogeneity tests, are significant, indicating that there are no endogeneity issues in the model. Additionally, the significance of the test for weak instruments proves the validity of instrumental variable used in the model. Thus, this study relies on the results of two-stage least squares tests.

Table 6. Two-stage least squares test results.

Independent variable	SMEs	All Firms
	(1)	(2)
Audited financial statements	0.720***	0.949***
	(0.204)	(0.221)
ICT adoption	0.019***	0.027***
	(0.034)	(0.036)
Log_firm_age	0.107***	0.054***
	(0.036)	(0.035)
Log_firm_size	0.147***	0.063***
	(0.044)	(0.033)
Sales_growth	0.0002**	0.0002**
	(0.0001)	(0.0001)
Financial sector development	0.003***	0.004***
	(0.001)	(0.001)
LogGDP_Pc	0.448***	0.498***
	(0.090)	(0.036)
Emerging countries	−0.106**	−0.081
	(0.041)	(0.054)
Industry dummies	Yes	Yes
Constant	1.586***	−1.688***
	(0.271)	(0.299)
R-squared	0.0079	0.0599
Log likelihood	−5823.557	−8280.052
Number of observations	4,954	6,790
Wu–Hausman test	9.20***	18.73***
Test of endogeneity	8.59***	0.01***
Weak instruments	50.53***	55.37***

Note: The dependent variable is the firms' financial availability. See Table 2 for the definitions of the variables. Standard errors are in parentheses. ** and *** indicate the 5% and 1% levels of significance, respectively. The Wu–Hausman and endogeneity tests examine whether the independent variables are free from error terms. The test for weak instruments checks whether the instrument variables fit with the model.

The coefficients for financial statements and ICT are positive and significant, indicating that firms with financial statements or ICT have more bank financing opportunities than those without. The significant coefficient of financial statements supports earlier literature, which states that SMEs need to prepare proper accounts, financial statements and business plans to effectively access finance (Htin Lin Aung, 2018; Kung & Gabriel, 2011; Machmud & Huda, 2011). Similarly, the significant result for ICT is consistent with the finding of Mushtaq et al. (2022), who found that ICT innovation positively contributes to SME financing. Therefore, financial statements and ICT can be mechanisms for solving information asymmetry issues from the firms' side.

Table 7. Robustness test results for Model 1.

Independent variable	Heckman selection test results			OLS results	
	SMEs	All Firms		LIDCs	EMs
	(1)	(2)	(3)	(4)	(5)
Audited financial statements	0.063***	0.140***	0.101***	0.103***	0.170***
	(0.130)	(0.120)	(0.032)	(0.032)	(0.028)
ICT adoption	0.147***	0.093***	0.074***	0.048***	0.156***
	(0.070)	(0.012)	(0.017)	(0.019)	(0.027)
Log_firm_age	0.072	0.095***	0.098***	0.035	0.200***
	(0.072)	(0.029)	(0.029)	(0.046)	(0.045)
Log_firm_size	0.390**	0.159***	0.196***	0.262***	0.219***
	(0.224)	(0.017)	(0.071)	(0.038)	(0.035)
Sales_growth	0.0002**	0.0002***	0.0002**	0.0004***	0.0001***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)

Independent variable	Heckman selection test results			OLS results	
	SMEs	All Firms		LIDCs	EMs
	(1)	(2)	(3)	(4)	(5)
Financial sector development	0.002***	0.002***	0.002***	0.002***	0.018***
	(0.0004)	(0.004)	(0.0004)	(0.001)	(0.003)
LogGDP_Pc	0.420***	0.340***	0.345***	−0.139	−1.959***
	(0.083)	(0.074)	(0.074)	(0.142)	(0.479)
Emerging countries	−0.035	0.034	0.029		
	(0.041)	(0.038)	(0.038)		
Industry dummies	Yes	Yes	Yes	Yes	Yes
SME_Acc			0.052		
			(0.036)		
SME_ICT			0.025		
			(0.016)		
Constant	−1.941***	−1.024***	−1.085***	0.425***	6.199***
	(0.788)	(0.222)	(0.224)	(0.445)	(1.558)
Rho	0.902	−0.166***	−0.163**		
Log likelihood	−5823.557	−11935.69	−11930.41	0.0942	0.1921
Number of observations	7,161	9,469	9,469	1,982	2,980
Selected numbers	4,962	6,800	6,800		

Note: The dependent variable is firms' bank credit accessibility. See Table 2 for the definitions of the variables. Standard errors are in parentheses. ** and *** indicate the 5% and 1% levels of significance, respectively.

The results reveal that SMEs in the ASEAN region with either financial statements or ICT, or both, have more bank credit accessibility than those without. Hence, SMEs will have more growth opportunities by easing their financial constraints. The results show that firm size and firm age positively influence firms' bank financing. Banks' credits are rationed to larger SMEs that have been operating for a longer period of time. Similarly, in Eastern European and Central Asian countries, larger SMEs have lower financial constraints than smaller firms. Both financial development and the country's economic development have a positive relation to SMEs' bank credit accessibility. Thus, SMEs in countries with low income and less developed financial sectors, such as Laos, Cambodia, and Myanmar, will have more financial constraints than in other ASEAN countries.

4.2.2. Robustness Tests

To ensure the validity of the results, further tests are conducted. To overcome any sample selection bias that the OLS may cause, the Heckman selection estimation is applied in Model 1. Heckman selection is an estimation method that eliminates the specification errors in the case of censored samples. The Heckman test comprises two equations: the first stage or selection equation estimates the regression function of the full rank of the population, and the second stage or output equation estimates the regression function of the selected sample (Heckman, 1979). Table 7 displays the results of Heckman selection estimation for the relationships between financial statements and ICT with firms' bank financing. Column (1) shows the results for SMEs and columns (2) and (3) present the results for all firms. Consistent with the results of the endogeneity tests, the results of the Heckman output indicate significant positive impacts of financial statements and ICT on SMEs' access to bank credit. The impacts are not significantly different between SMEs and large firms.

Additionally, the OLS tests are conducted by dividing SMEs into two groups of countries: EMs and LIDCs. The results of the impacts of financial statements and ICT on SMEs' bank financing are shown in columns (4) and (5) in Table 7. The results show both significant and positive relations of financial statements and ICT with SMEs' bank financing. The impacts of the two variables (financial statements and ICT) are larger in EMs than in LIDCs. Therefore, the results provide strong evidence of the benefits of applying financial statements and ICT in SMEs' bank financing both in EMs and LIDCs.

4.3. The Estimated Results of Model 2

Table 8 presents the probit regression results for Model 2, which investigates the relation of financial statements and ICT with collateral payments in accessing bank loans. Columns (1) to (3) show that financial statements and ICT have a significant negative impact on SMEs' collateral payment. Thus, SMEs with financial statements and ICT have higher probabilities of achieving uncollateralized bank loans than those without. Other variables, such as firm size and age, have no significant impact on SMEs' collateral payment. The size of a country's economy negatively influences SMEs' collateral payment. Thus, SMEs in countries with more developed economies will face fewer collateral issues. Additionally, the results indicate that SMEs in EM countries require less collateral in accessing bank loans.

Table 8. The impacts of financial statements and ICT on collateral payments.

Independent variable	SMEs			All Firms		
	(1)	(2)	(3)	(4)	(5)	(6)
Audited financial statements	−0.371***		−0.314***	−0.244***		−0.306***
	(0.070)		(0.074)	(0.090)		(0.102)
ICT adoption		−0.172***	−0.123***		−0.066	−0.030
		(0.039)	(0.045)		(0.049)	(0.055)
Log_firm_age	−0.165	−0.152	−0.147	−0.111	−0.118	−0.100
	(0.145)	(0.146)	(0.145)	(0.115)	(0.115)	(0.115)
Log_firm_size	0.005	0.054	0.097	0.038	−0.061	0.028
	(0.099)	(0.104)	(0.105)	(0.060)	(0.071)	(0.073)
Sales_growth	0.0001	0.0001	0.0001	0.0003	0.0003	0.0003
	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Financial development	0.003	0.001	0.001	−0.002	−0.001	−0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
LogGDP_Pc	−0.745***	−0.911***	−0.832***	−0.516***	−0.584***	−0.555***
	(0.370)	(0.375)	(0.375)	(0.304)	(0.304)	(0.307)
Emerging countries	−0.678***	−0.648***	−0.630***	−0.647***	−0.642***	−0.623***
	(0.199)	(0.201)	(0.202)	(0.172)	(0.171)	(0.173)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
SME_Acc				−0.087		−0.026
				(0.098)		(0.121)
SME_ICT					−0.058	−0.044
					(0.304)	(0.057)
Constant	4.114***	4.501***	4.294***	3.398***	3.544***	3.154***
	(1.076)	(1.080)	(1.087)	(0.870)	(0.869)	(0.878)
Pseudo R-squared	0.1335	0.1277	0.1373	0.1014	0.0932	0.1026
Number of observations	2,011	2,030	2,011	3,032	3,058	3,032

Note: The dependent variable is collateral payment. See Table 2 for the definitions of the variables. Robust standard errors are in parentheses. *** indicates a 1% level of significance.

Columns (4) to (6) illustrate the determinants of collateral payment for all firms. The coefficient of financial statements is significant and negative, but that of ICT is insignificant. Therefore, financial statements provide benefits for both SMEs and large enterprises in acquiring bank credit, but ICT does not show the impacts on all firms. Additionally, the SME dummies show that there are no significant differences in the impacts of financial statements and ICT between SMEs and large firms.

Table 9. Robustness test results.

Independent variable	Heckman selection test results			Probit model results	
	SMEs	All Firms		LIDCs	EMs
	(1)	(2)	(3)	(4)	(5)
Audited financial statements	−0.329***	−0.289***	−0.281***	−0.165	−0.380***
	(0.076)	(0.052)	(0.080)	(0.152)	(0.089)
ICT adoption	−0.149***	−0.115***	−0.083**	−0.020	−0.141***
	(0.048)	(0.029)	(0.042)	(0.095)	(0.052)
Log_firm_age	−0.183	−0.176**	−0.175**	0.189	−0.060
	(0.136)	(0.088)	(0.088)	(0.250)	(0.178)
Log_firm_size	−0.092	−0.114***	−0.160***	0.066	0.130
	(0.320)	(0.043)	(0.054)	(0.189)	(0.126)
Sales_growth	−0.000	−0.0001	0.0001	0.0001	0.0003
	(0.0004)	(0.0002)	(0.0001)	(0.001)	(0.0003)
Financial sector development	−0.002	−0.004***	−0.004***	0.001	0.012
	(0.004)	(0.001)	(0.001)	(0.002)	(0.012)
LogGDP_Pc	−0.634	−0.240	−0.263	0.879	−2.672***
	(0.476)	(0.240)	(0.273)	(0.901)	(0.862)
Emerging countries	−0.555***	−0.429***	−0.417***		
	(0.312)	(0.141)	(0.139)		
Industry dummies	Yes	Yes	Yes	Yes	Yes

Independent variable	Heckman selection test results			Probit model results	
	SMEs	All Firms		LIDCs	EMs
	(1)	(2)	(3)	(4)	(5)
SME_Acc			−0.005 (0.091)		
SME_ICT			−0.043 (0.043)		
Constant	4.530*** (0.987)	3.497*** (0.681)	3.603*** (0.684)	−1.441 (2.844)	9.793 (6.079)
Rho/Pseudo R-squared	−0.898	−0.898	−0.907	0.0363	0.0499
Log likelihood	−4759.68	−6803.02	−6802.13		
LR test of independent variables	0.02	3.04**	3.44**		
Number of observations	7,161	9,469	9,469	929	1,082
Selected numbers	2,011	3,032	3,032		

Note: The dependent variable is collateral payment. See Table 2 for the definitions of the variables. Standard errors are in parentheses. ** and *** indicate the 5% and 1% levels of significance, respectively.

Earlier studies highlight firm size and firm age as the determinants of collateral payment in accessing bank loans (Chakraborty & Hu, 2006; Menkhoff et al., 2006; Rahman, Rahman, et al., 2017). In this study, firms' internal factors (firm size and firm age) do not have any significant effects on SMEs' collateral payment for loan acquisition. The results indicate collateral as a core requirement for SMEs in accessing bank loans. As external factors, financial sector development does not have any significant influence on collateral payment, but the size of the economy has a significant negative impact on SMEs' collateral payment. Additionally, SMEs in EMs require less collateral to access bank loans than those in LIDCs. The economic situation, foreign trade, and financial infrastructure in EM countries are more developed compared to those in LIDCs. These external factors seem to support SMEs in reducing collateral issues and ultimately enhancing their access to bank credit.

Model 2 examines the impacts of financial statements and ICT on SMEs' collateral issues. It is impossible for the existence of collateral issues to have reverse effects on both financial statements and ICT. Thus, the study assumes that neither financial statements nor ICT relate to error terms, and there are no endogeneity concerns regarding these variables.

4.3.1. Robustness Tests

Like in Model 1, this study checks the robustness of the results by using Heckman selection tests for SMEs and all firms and the probit regression tests for SMEs grouped into EMs and LIDCs. The results of the Heckman selection tests are illustrated in columns (1) to (3) in Table 9. The coefficients for financial statements and ICT are significant and negative for both the SME and the 'all firms' groups. The results are consistent with the normal probit regression results and support the negative relationship of financial statements and ICT with SMEs' collateral challenges.

The probit regression results for SMEs in LIDCs and EMs are shown in columns (4) and (5) in Table 9. The coefficients for financial statements and ICT are significant and negative in EMs, supporting the results of the probit regression and Heckman selection tests. The results are insignificant in LIDCs as the sample size becomes too small and may impact the results. Since most of the results show significant coefficients for financial statements and ICT, they prove that SMEs with financial statements and ICT face fewer collateral issues compared to the SMEs without.

5. Conclusion

This study aims to identify potential solutions to the constraints faced by SMEs in accessing bank credit as well as ways to reduce collateral-related problems that many SMEs encounter. Drawing on information asymmetry theory, the study examines the impact of financial statements and ICT on SMEs' bank credit accessibility and collateral payments. The analysis is based on the BEEPS data provided by the World Bank. The descriptive analysis revealed that around half of the SMEs that applied for bank credit were unsuccessful. Moreover, more than 75% of loans taken out by SMEs and large firms rely on collateral, suggesting that collateral will be a common issue for firms seeking bank credit in the selected ASEAN countries. This finding may partly reflect the inefficiencies in the banking industry in these countries.

The results show the positive impact of financial statements and ICT on SMEs' bank financing in the selected ASEAN countries. This explains that SMEs with either financial statements or ICT, or both, have more bank credit viability than those without financial statements or ICT. The internal factors of firm age, firm size, and sales growth positively influence SMEs' bank credit viability, and the external factors of financial development and a country's economic development significantly contribute to the promotion of SMEs' bank financing. Additionally, the analyses show the significant negative relation of financial statements and ICT to SMEs' collateral payment in getting bank credit. Firm characteristics of age, size, and sales

growth do not have a significant impact on collateral payments. A country's economic development has a negative relation to SMEs' collateral payment. The impacts of financial statements and ICT on SMEs' bank financing are greater in EM countries than in LIDCs. This may be due to EM countries having a more developed financial infrastructure, such as a credit guarantee system and a credit registry, compared to LIDCs. By providing business and financial information to financial institutions, financial statements and ICT can assist SMEs in accessing a credit guarantee loan from banks with less collateral payment. Hence, the effects of financial statements and ICT on SMEs' bank financing are more significant in countries with a more developed financial infrastructure than in those with a less developed financial infrastructure.

In summary, SMEs' financial statements and ICT can support SMEs to not only promote their bank financing (cheaper finance) but also lower collateral issues through enhancing their information disclosure. Thus, SMEs with either financial statements or ICT, or both, have more opportunities to access bank credit and a lower probability of collateral payment than those without. These opportunities will enable SMEs to have more growth potential. However, in the ASEAN region, especially in Myanmar, Laos and Indonesia, the rate of SMEs' use of ICT and financial statements is very low. As a result, these countries have a larger rate of collateralized loans and a lower rate of bank financing compared to countries with a larger rate of SMEs using ICT and financial statements, such as Malaysia and the Philippines. To foster SME financing, these countries should encourage and support SMEs to keep financial statements and implement ICT. Both financial statements and ICT can bring more benefits to SMEs through a more developed financial infrastructure and by providing reliable information to credit guarantors or credit registries. This result highlights the need for financial infrastructure development to promote SME financing and mitigate collateral issues.

Financial statements and ICT can be used as tools to reduce information asymmetry as they can minimize banks' loan evaluation costs and non-performing loans. Regardless of whether a developed lending environment exists or not, information transparency is vital to banks' credit decisions. Hence, encouraging and supporting SMEs to keep financial statements and utilize ICT will not only enable SMEs to access cheaper finance but will also support banks' performance. There are various ways to support SMEs to adopt and manage financial statements and ICT. Providing accounting training and limiting auditing and accounting fees will allow SMEs to keep audited financial statements. In Malaysia, the SME Corporation provides financial management training and guidance on how to prepare financial statements (SME Corporation-Malaysia, 2019). This type of assistance is crucial for SMEs to promote their bank credit accessibility through keeping proper financial records. An easily accessible online network infrastructure is necessary to encourage firms to apply ICT. Additionally, raising awareness of the benefits of financial statements and ICT with firms is important to enhance SMEs' financial statements and ICT adoption.

A limitation of this study is that it was unable to examine the precise effects of financial statements and ICT on SMEs' collateral issues due to the lack of data. Although the BEEPS investigates firms' collateral and loan amounts, many are reluctant to disclose the precise amounts. Therefore, this study measures the collateral issue based on the existence of collateral in acquiring a bank loan. If the data of firms' collateral-to-loan ratios is made available, further studies can provide explanations regarding the role of financial statements and ICT in SMEs' collateral challenges.

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