Working Paper 2023.2.3.10
- Vol 2, No 3

VAI TRÒ TRUNG GIAN ĐIỀU TIẾT CỦA CÁC KHOẢN VAY DOANH NGHIỆP TRONG MỐI QUAN HỆ GIỮA TÀI CHÍNH TOÀN DIỆN VÀ HIỆU QUẢ HOẠT ĐỘNG CỦA CÁC DOANH NGHIỆP CÔNG NGHỆ THÔNG TIN: MỘT SỐ KẾT QUẢ TỪ VIỆT NAM

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Tóm tắt

Bài nghiên cứu phân tích tác động của tài chính toàn diện (FI) đối với hiệu quả hoạt động của các công ty Công nghệ thông tin (ICT) tại Việt Nam thông qua việc sử dụng biến trung gian là các khoản vay doanh nghiệp. Để khám phá mối quan hệ giữa các yếu tố này, phân tích trung gian (mediation analysis) được áp dụng đối với bộ số liệu bao gồm chỉ số FI, được tạo bởi phương pháp Phân tích thành phần chính (PCA), và dữ liệu của hơn 200,000 doanh nghiệp ICT từ năm 2008 đến năm 2018. Kết quả nghiên cứu cho thấy FI ảnh hưởng tích cực đến các khoản vay doanh nghiệp, nhưng lại có tác động tiêu cực trực tiếp đến lợi nhuận của công ty, cũng như gián tiếp thông qua các khoản vay. Nghiên cứu cũng cho thấy rằng lượng vốn vay doanh nghiệp cao giúp nâng cao doanh thu bán hàng, nhưng không cải thiện biên lợi nhuận ròng của các doanh nghiệp ICT. Như

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vậy có thể thấy rằng FI thành công trong việc giảm bớt các hạn chế tài chính cho các doanh nghiệp ICT tại Việt Nam; tuy nhiên, chi phí vay cao và việc sử dụng các khoản vay không đúng cách có thể làm giảm biên lợi nhuận ròng của các doanh nghiệp, mặc dù doanh thu bán hàng đã tăng lên.

Từ khóa: Tài chính toàn diện, các khoản vay doanh nghiệp, tiếp cận tài chính, lợi nhuận doanh nghiệp

THE MEDIATING ROLE OF CORPORATE BORROWINGS IN THE NEXUS BETWEEN FINANCIAL INCLUSION AND PERFORMANCE OF ICT FIRMS: NEW INSIGHTS FROM VIETNAM

Abstract

This paper analyzes the impacts of financial inclusion (FI) on the performance of Information and Communication Technology (ICT) firms in Vietnam using corporate borrowings as the mediating variable. We apply mediation analysis on the FI index calculated by the principal component analysis (PCA) method and a sample of over 200,000 ICT firms from 2008 to 2018 to explore the nexus among these variables. Our findings reveal that FI positively affects corporate borrowings, but has a negative direct effect on firm profitability, as well as a negative indirect effect through corporate borrowings. We also find that higher levels of borrowings help firms promote sales efficiency, but do not improve their net profit margin. FI has successfully eased financial constraints for ICT firms in Vietnam; however, the high cost of borrowings and the improper use of borrowed funds may impede firms' profit margin, despite sales improvement.

Keywords: Financial inclusion, corporate borrowings, financial access, firm profitability

JEL: O160, O430, G210, G320, L250, L860

1. Introduction

Since the "Doi Moi" Reform in 1986, Vietnamese economy has witnessed remarkable achievements over the decades. The economic structure is shifting towards industrial, services industry or privatization, and encouraging a booming startup wave. However, financial development has not been well-adapted to the growth of the economy, as only 26% of Vietnamese firms have access to formal credit (Archer et al., 2020).

Financial inclusion (FI) has become a hot topic in academic research as it is considered as a critical part of financial development that potentially affects the whole economy. At micro level, the FI level can have a considerable impact on a firm's activities and performance. However, the impacts of national FI on firm performance, especially, on firm profitability has not been sufficiently researched, especially on the impact channel.

Information and communications technology (ICT) firms have been among leading drivers of Vietnamese economic growth (ITA, 2022). However, these firms face special credit constraints due to their uniqueness. ICT industry deals with a complicated specialization that outside investors or bank employees find it hard to understand (Aoun & Heshmati, 2008). The hesitation of lending increases the cost of debt and requires firms to secure their borrowings by collaterals, normally

with tangible assets (Bakhtiari et al., 2020). However, ICT industry includes many young firms lacking collaterals and depending on external sources to invest and expand R&D activities (Brown et al., 2012). These constraints limit ICT firms in Vietnam from participating in research and development of advanced information technology products and services. An improvement in FI may, therefore, promote ICT firms' performance.

This research aims to examine the effects of FI on the performance of ICT firms and whether corporate borrowings (i.e., financial access) can significantly channel this relationship. It makes several contributions to the literature. First, this paper is among a few pioneering studies that use PCA method to construct a long time series data on FI from several indicators capturing different aspects of access, availability, and usage for an emerging economy like Vietnam. Second, we identify an important channel through which FI affects firm performance, which is corporate borrowings. And third, upon applying the mediation analysis, we are able to compute the direct, indirect, and total effects of FI on firm performance.

2. Literature review

2.1. The concept of financial inclusion

FI has emerged as a necessary pillar of an economy to achieve sustainable development. According to the World Bank (2018), "financial inclusion" means that individuals and businesses have access to useful and affordable financial products and services that meet their needs (transactions, payments, savings, credit, and insurance) in a responsible and sustainable way. As this concept embraces not only individuals but also firms and nations, FI is known as a multidimensional and complex definition (Tram et al., 2023)**.** It could be represented by an index, capturing three dimensions: access, availability, and usage. An enhancement of this index essentially can reflect an improvement on the financial environment surrounding enterprises.

2.2. The impact of financial inclusion on firm performance

The impact of FI on firm performance is measured both at the country scale and firm level. On the one hand, the FI-economic growth relationship is different across countries. While Van et al. (2021), Sethi & Acharya (2018) and Kim et al. (2018) show a strong relationship between financial inclusion and economic growth, Sahay et al. (2015) and Karim et al. (2022) indicate that financial inclusion may harm economic growth after a specific threshold. Similarly, a positive effect of financial inclusion on financial stability is found in studies by Neaime & Gaysset (2018), and Ahamed & Mallick (2019) while a negative effect is identified by Khan (2011).

On the other hand, FI impact also varies across different firms or sectors within a country. FI is found to significantly reduce financial constraints such as asymmetric information; or expand financial resources, and enhance the financial ability of firms including firm dynamism and innovation, investment opportunities and more efficient incorporation (Ben et al., 2020; Koomson & Ibrahim, 2018; Demirgüç-Kunt et al., 2015). Besides the positive effects, FI is also reported to negatively affect firm growth after a threshold point (Nizam et al., 2021). Additionally, literature

has identified banking competition (Chauvet & Jacolin, 2017; Owen & Pereira, 2018), financial innovation or R&D spillover (Lee et al., 2020; Le et al., 2023), financial stability level (Beck, 2014), as potential channels to facilitate FI and promote businesses growth.

In short, there has been limited research for Vietnam regarding the relationship between FI at national level and firm performance, especially over the long run. Thus, investigating Vietnam would help identify some experiences for other emerging economies to encourage FI and support firms' growth. The issue of particular importance is the channel through which FI impacts firm performance.

3. Methodology

3.1. Data sources and variable construction

3.1.1. The measure of financial inclusion

To measure FI, we extract data from the Financial Access Survey (FAS) provided by the International Monetary Fund (IMF). Specifically, we collect nine indicators that capture three broad aspects of FI: Usage, Access, and Availability, and normalize them with the min-max approach by each year. After that, we apply the 2-stage PCA (Cámara & Tuesta, 2014; Tram et al., 2023) to compute scores and aggregate the index for each year. The PCA method allows us to simplify the complexity of the dataset without losing the underlying essence. Given that the PCA method assigns weights to the components based on their respective contributions, the constructed index can provide a synthetic view of a country's progress in achieving FI over time (OECD, 2008) and is deemed better than those using an equal weight.

3.1.2. The measure of firm performance

As a multidimensional concept, firm performance can be measured by various aspects such as profitability, market share, efficiency, or labor productivity. For this study, we choose return on assets ratio, a widely used proxy of profitability since Venkatraman & Ramanujam (1986), as the main dependent variable. Besides this variable, we also use asset turnover and net profit margin of ICT firms as two other dependent variables for further regressions. Because these variables are not readily available, we calculate them based on raw data on net income, net sales and total assets extracted from the Vietnamese Enterprise Survey (ES) conducted annually by the General Statistical Office of Vietnam (GSO).

3.1.3. The measure of corporate borrowings

We measure corporate borrowings by loan intensity ratio, which is calculated by formal loans (i.e., loans from banks and financial institutions) that a firm can access divided by the firm's total assets at the beginning of the year. The data is also collected from the ES. This ratio captures how much money a firm can borrow from a formal financial institution relative to its total assets. This variable will proxy for the effective financial access of firms.

3.1.4. Other variables

Besides the main variables of interest, we additionally control for several variables capturing firm characteristics, namely, firm size, firm type, firm age, as well as the region where the ICT firm operates. These variables are constructed based on information available in the ES.

Table 1 presents definitions of all variables constructed for the empirical investigation with FI assessed by country-level data from the FAS (IMF), and all other variables measured at the firm level using data from the GSO's survey. Although data is available from 2000 to 2022, we have to limit our sample to the 2008-2018 period due to the following reasons. First, substantial inconsistency in questionnaires prevents us from using pre-2008 data. Second, as the COVID-19 pandemic has caused peculiar changes to the market and firm behaviors, we decided to exclude data beyond 2019. After the collection stage, we carefully filter data to remove missing data on firm performance, corporate borrowings, firm size, firm age, firm type or location, and drop observations with a negative value of either firm assets, liabilities, equity, or borrowings. Finally, having removed all outliers, our final sample includes 201,251 ICT firms, with a total of 294,259 observations over the 2008-2018 period.

3.2. Summary statistics

Table 1 provides a statistical summary of key variables used in this study. To exclude the effect of inflation, all nominal variables, such as corporate borrowings, total assets, profit, and sales, are deflated by the price index with the base year of 2010.

Over the 2008-2018 period, the FI index has increased significantly, with a mean value of 1.085, indicating improvements in either the access, availability or usage of financial products and services. This can be a positive sign for Vietnam's financial development. An average ICT firm in Vietnam borrows roughly 1.2 billion Vietnamese dong per year (using 2010 price index). Loan values are rather diverse, from as small as 1.5 million to nearly 21 billion Vietnamese dong per year.

Returns on assets are found to be 0.005 (or 0.5 percentage point) on average. While some firms have achieved some remarkable returns of 12.838 percentage points, several firms experienced losses, showing a great discrepancy in profitability among firms in the sample. Data on asset turnover shows that all firms have positive ratios, with some firms having remarkable sales records, about 90 times larger than the average. With a negative average net profit margin (-0.041), ICT firms in Vietnam are generally unprofitable relative to their revenues.

Table 1. Statistics summary

Variable	Mean	Std. Dev.	Min	Max	Definition
$log(Fin\_inc)$	-0.330	1.376	-4.632	1.170	Financial inclusion index (log)[2]

[2] Note that we sum the raw PCA index with 1.87 (this is because the smallest raw PCA index value is -1.86), as we need to take natural logarithm of this index in our regressions later on.

ROA	0.005	0.179	-13.547	12.838	Return on assets, Net income over Total assets at the end of the year
$Corp\_borrow$	0.098	0.151	0	0.999	Corporate borrowing intensity, Formal Loans over Total assets at the beginning of the year[3]
$Asset\_turnover$	1.689	3.834	0	91.061	Asset turnover, Net sales over Total assets at the end of the year
$Profit\_margin$	-0.041	0.886	-72	59.250	Net profit margin, Net income over Net sales at the end of the year
$Firm\_size$	1.918	1.028	0	10.798	Total number of laborers at the end of the year (log)
$Firm\_age$	1.928	0.676	0	4.263	Firm age (log)
$State-owned$	0.003	0.052	0	1	Dummy variable, = 1 if firm type = state-owned enterprise, =0 otherwise
$Collective$	0.004	0.060	0	1	Dummy variable, = 1 if firm type = collective enterprise, =0 otherwise
$Private$	0.541	0.498	0	1	Dummy variable, = 1 if firm type = private enterprise, =0 otherwise
$Foreign$	0.010	0.101	0	1	Dummy variable, = 1 if firm type = foreign enterprise, =0 otherwise
$Joint\ stock$	0.381	0.486	0	1	Dummy variable, = 1 if firm type = joint stock enterprise, =0 otherwise
$Other$	0.062	0.241	0	1	Dummy variable, = 1 if firm type = other enterprise types, =0 otherwise
$Red\ River\ Delta$	0.347	0.476	0	1	Dummy variable, =1 if firm located in Red River Delta region, =0 otherwise
$Central\ Coast$	0.122	0.328	0	1	Dummy variable, =1 if firm located in Central Coast region, =0 otherwise
$Central\ Highlands$	0.027	0.162	0	1	Dummy variable, =1 if firm located in Central Highlands region, =0 otherwise

[3] This is to capture the notion that any formal loans require some time to take effect on firm performance.

Mekong River	0.060	0.237	0	1	Dummy variable, =1 if firm located in Mekong River region, =0 otherwise
Northern midlands and mountains	0.030	4.121	0	1	Dummy variable, =1 if firm located in Northern midlands and mountains region, =0 otherwise
Southeast	0.413	0.492	0	1	Dummy variable, =1 if firm located in Southeast region, =0 otherwise

The average number of workers per firm is slightly under two. This seems reasonable for ICT firms because their businesses may depend more on machines, software, technologies, etc., rather than labor, which may, in turn, indicate the capital-intensive nature of such firms. It also highlights that ICT firms in Vietnam are mostly small and hence, may require substantial financial support for development. The sampled ICT firms have been in operation for a rather long time, with an average age of nearly seven years.

Based on their ownership, the ICT firms in our sample can be classified into several categories, including state-owned, collective, private, foreign, joint-stock, and other types. On average, private firms account for the biggest proportion (54.1%), while state-owned enterprises represent only 0.3%. Although there is a large number of joint stock firms (38.1%), foreign firms make up about 1%. By region clustering, we can see that nearly half of the ICT firms are in the Southeast region. The number of ICT firms in the Red River Delta and Central Coast also accounts for a large proportion of 35% and 12% of firms located there, respectively. These regions are home to many economic zones, big cities, and ICT industry hubs such as Thai Nguyen, Bac Ninh, Ho Chi Minh, and Hanoi.

3.3. The empirical model

3.3.1. The mediation analysis

In this study, we are interested in examining how FI significantly impacts firm performance and whether corporate borrowings are a significant channel of the impact. Specifically, we investigate if FI directly affects firm performance, given its influence on the economic and financial environment where the firm operates. Additionally, we examine the potential indirect effect of FI on firm performance, specifically through its influence on corporate borrowings. The appropriate methodology that well serves our purpose is the mediation analysis, which has been used widely in psychology, business management, epidemiology (e.g., Hayes & Scharkow, 2013), and econometric research (Theil, 1958; Le et al., 2022). The main idea of this technique is to investigate if an independent variable exerts its impact on the dependent variable via a channel, thereby clarifying the nature of the known nexus between the dependent variable and the independent variable (MacKinnon, 2012). In this paper, we hypothesize that corporate borrowings act as a mediating factor for FI's influences on firm performance. This is motivated by the economic

reasoning that FI enhances firms' access and usage of financial resources that in turn affects firm performance. A graphical representation of the channels is included in Figure 1 below.

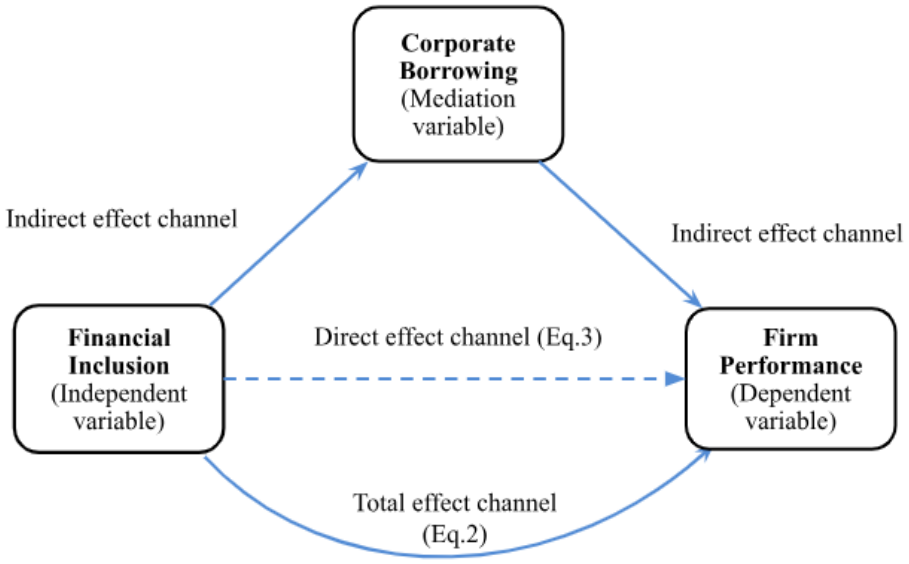

Figure 1. Graphical representation of the mediation analysis

To conduct the mediation analysis, we apply the four-step procedure proposed by Baron & Kenny (1986). This procedure is essential for the detection of the potential interaction between FI and corporate borrowings on firm performance. Each of these four steps is depicted by an equation as follows:

$$\boldsymbol{ROA_{it} = \alpha_i + \alpha_1 Corp\_borrow_{it} + \mu X_{it} + v_{it}} \quad \textbf{(Eq.1)}$$

$$\boldsymbol{ROA_{it} = \alpha_i + \beta_1 log\ (Fin\_inc_t)\ + \mu X_{it} + v_{it}} \quad \textbf{(Eq.2)}$$

$$\boldsymbol{ROA_{it} = \alpha_i + \alpha_2 Corp\_borrow_{it} + \beta_3 log\ (Fin\_inc_t)\ + \mu X_{it} + v_{it}} \quad \textbf{(Eq.3)}$$

$$\boldsymbol{Corp\_borrow_{it} = \alpha_i + \beta_2 log\ (Fin\_inc_t)\ + \mu X_{it} + v_{it}} \quad \textbf{(Eq.4)}$$

In these equations, ROA_{it} is return on asset of firm i *at the end of year* t; $Corp\_borrow_{it}$ is the ratio of formal loans over the total assets of firm i *at the beginning of year* t; $log\ (Fin\_inc_t)$ is natural logarithm of the FI index; X_{it} is the vector of control variables that affect firm performance including firm age, firm size, firm type and region; and v_{it} is the error term. While Equation (1) tests the significance of corporate borrowings on firm performance, Equation (2) estimates the total effect of FI on this variable. In particular, it measures the responsiveness of return on assets (the dependent variable) when FI index (the independent variable) changes by one log point, assuming corporate borrowings (the mediating variable) are unchanged. Equation (3) examines the direct effect of FI (in the presence of corporate borrowings). Finally, Equation (4) reveals how FI induces corporate borrowings.

Accordingly, we are able to capture the total effect by $\beta 1$ in Equation (2) and the direct effect by $\beta 3$ in Equation (3). The indirect effect $\beta_{indirect}$ is determined, as per Sobel (1982), by both Equations (3) and (4) as follows:

$$\boldsymbol{\beta_{indirect} = \alpha_2 * \beta_2}$$

The test statistic of this indirect effect follows a normal distribution and is given by:

$$\boldsymbol{t = \frac{\alpha_2 * \beta_2}{\sqrt{\alpha_2^2 * Var(\beta_2) + \beta_2^2 * Var(\alpha_2)}}}$$

where $Var(\alpha_2)$ and $Var(\beta_2)$ are the variance of α_2 and β_2, respectively.

3.3.2. Further analysis

To gain more insights into the efficiency of firms in taking advantage of their financial resources, we next examine how corporate borrowings affect asset turnover (i.e., a sales intensity variable) and net profit margin (i.e., a profit intensity variable) of firms. To that end, we consider the following two regression equations:

$$\boldsymbol{Asset\_turnover_{it} = \alpha_i + \gamma_1 Corp\_borrow_{it} + \mu X_{i,t} + v_{i,t}} \quad \textbf{(Eq.5)}$$

$$\boldsymbol{Profit\_margin_{it} = \alpha_i + \gamma_2 Corp\_borrow_{it} + \mu X_{i,t} + v_{i,t}} \quad \textbf{(Eq.6)}$$

Where $Asset\_turnover_{it}$ is the asset turnover of firm i at the end of year t; $Profit\_margin_{it}$ is the net profit margin of firm i in year t

4. Results & Discussion

4.1 Baseline results

The variation of the generated FI over the 2008-2018 period is shown in Figure 2. From a level as low as 0.522 initially, the index experienced an upward trend overall despite a slight drop in 2009-2010. This possibly reflects the negative impact of the 2008-2009 Global Financial Crisis first, and then, to achieve economic development, poverty reduction, and income equality, many governments have attempted to take care of the unbanked or financially excluded population by making critical improvements in different aspects like availability of, usage of, and access to financial products and services. The access to finance dimension makes up the largest proportion of the index (Table A1), indicating its considerable contribution to the overall FI index. It may also explain the fact that bankcards and financial accounts are becoming a necessary part of individuals' and firms' transactions and capital management. With the increase in individual deposit accounts, bank branches, ATMs, and outstanding loans and deposits, the financial market can become more active and thereby, able to assist firms' financial access. This is also evidenced by the correlation between FI and average formal loans shown in Figure 2.

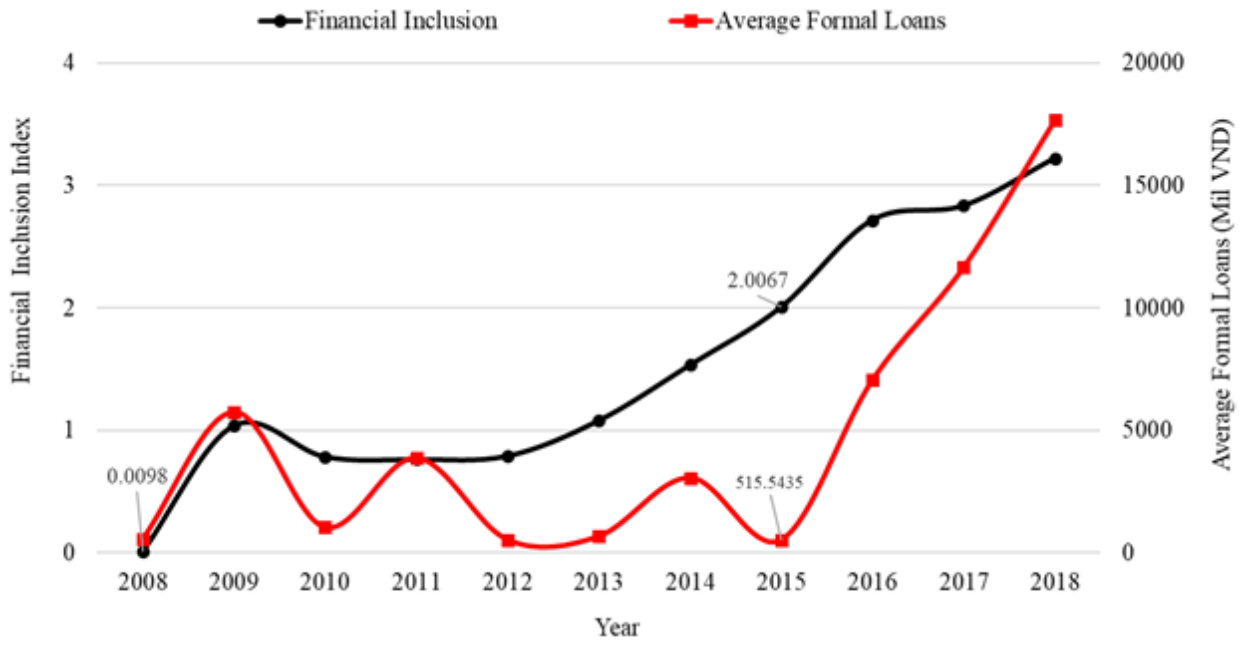

Figure 2: Trend of Financial Inclusion and Formal Loans in Vietnam (2008-2018)

Table 2 below shows the estimations of OLS and fixed effect regressions, in which every two columns respectively represent results for Equations (1) to (4). Column 2.1 shows that corporate borrowings have a significant negative impact on firm return on assets at the 1% significance level, consistent with part of the literature review (Ibhagui & Olokoyo, 2018) indicating the negative relationship. This implies that Vietnamese firms may ineffectively utilize borrowed capital or may relate to the improper use of working capital (PwC, 2018). When the investment market bombarded, firms may use borrowed capital to buy stocks, bonds, real estate, etc., instead of the original production purposes. SMEs managers might fail to distinguish personal finance from corporate finance, and may use firm loans for unreasonable business investments or misconduct their book-keeping practices.

Column 2.3 shows a negative and significant association between FI and ROA, which indicates the negative total effect. Note that some previous studies have mentioned that the negative effect emerged after a certain level of FI (Nizam et al., 2021).

Table 2. Association of FI, corporate borrowings and returns on assets

	ROA						***Corp_borrow***	
Dep. Var.	**(2.1)**	**(2.2)**	**(2.3)**	**(2.4)**	**(2.5)**	**(2.6)**	**(2.7)**	**(2.8)**
	OLS	**FE**	**OLS**	**FE**	**OLS**	**FE**	**OLS**	**FE**
$log\ (Fin\_inc)$			-0.001***	-0.001***	-0.001***	-0.001***	0.011***	0.013***
			(-6.910)	(-5.350)	(-6.110)	(-3.310)	(59.010)	(43.990)

$Corp\_borrow$	-0.011*** (-3.320)	-0.025*** (-4.310)			-0.010** (-3.010)	-0.024*** (-4.040)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations.	294,259	294,259	294,259	294,259	294,259	294,259	294,259	294,259

*Note: Robust t-statistic in parentheses. ***p<0.01, **p<0.05, *p<0.1. Control variables include: Size, Age, Type, Region.*

The increasing FI index reflects the reduction of financially excluded groups and suggests better access to and more active use of financial products and services as well as higher participation in the formal financial system (Raouf, 2022). This can stimulate money circulation in the market and assist financially struggling firms through intermediaries. However, increased capital access does not always imply positive firm performance, especially when there is a threshold (Nizam et al., 2021).

In Column (2.5), we observe significant detrimental effects of FI index and corporate borrowings on the firm's return on assets (ROA) (-0.001 and -0.010, respectively). Clearly, the impact of the national FI on firm performance is less pronounced than that of firm borrowings. Columns (2.7) and (2.8) present a positive and significant effect of FI on corporate borrowings, showing the role of FI in enabling external financial access to firms. Interestingly, the firm's profitability is worsened despite having more financial access, which is supported by increasing FI. For this unexpected problem, we conjecture that the implemented FI strategy has not been well-applied, resulting in aggressive financial access for firms. Another explanation can be from the perspective of financial stability, as motivated by the "too much finance" phenomenon. The finance-growth relationship can exhibit the hump shape and lead to financial instability, such as credit standards erosion (e.g., subprime), bank reputational risk, inadequate regulation of MFIs (Morgan & Pontines, 2014), or credit crunch (Bach et al., 2021) for firm performance. Thus, it can be easier for firms to access more external finance, but they may not manage their loans well to gain profits or even suffer a heavier financial burden.

When it comes to ICT firms' characteristics, which are known to be capital-intensive, we acknowledge that ICT sectors include many young firms that lack collaterals and have low internal capital and thus, depend on external sources to invest and expand R&D activities (Brown et al. 2012). They may also face high costs of debt that mitigate the profits they can generate eventually, which will be considered in further analysis.

Using multiple regressions, we calculate the total effect, direct and indirect effect of FI on Firm performance. Column (2.3) shows the total effect of FI on firm performance with a negative and significant coefficient of FI (-0.001). The direct effect captured in Column (2.5) is also significant and negative. Meanwhile, the indirect effect is not readily available and must be interpreted by both coefficients in Equation (3) and (4). Specifically, we have α_2= -0.010, Var(α_2)= 0.0033^2, β_2 = 0.011 and Var(β_2)=0.0002^2 respectively, thereby, determine as $\beta_{indirect}$= -0.010*0.011= -0.0001 with the t-statistic=-3.026, which is significant at the level of 1%.

Overall, these results reveal the significant and negative influence of FI on a firm's return on assets. On the one hand, FI can directly affect the return on assets of firms with the coefficient of 0.001. On the other hand, FI exerts an indirect influence on firms' return on assets through enhancing their borrowings.

Table 3. Effects of corporate borrowings on asset turnover and net profit margin

	Asset_turnover		***Profit_margin***	
Dep. Var.	**(3.1)**	**(3.2)**	**(3.3)**	**(3.4)**
	OLS	**FE**	**OLS**	**FE**
Corp_borrow	0.669***	0.367***	-0.046***	-0.070***
	(12.130)	(4.320)	(-3.340)	(-3.110)
Controls	Yes	Yes	Yes	Yes
Observations	294,259	294,259	294,259	294,259

*Note: Robust t-statistic in parentheses. ***p<0.01, **p<0.05, *p<0.1. Control variables include: Size, Age, Type, Region*

We take further analysis by examining the effect of corporate borrowings on asset turnover intensity and net profit margin. Table 3 presents the results of Equation (5) and (6), with OLS and fixed effect estimation respectively. We can see that corporate borrowings have a significant positive effect on asset turnover (0.669 percentage points) but a negative effect on NPM (-0.046 percentage points). The increase in asset turnover ratio caused by the impact of corporate borrowings possibly infers the purpose of hastening firm sales. Despite the bigger sales number, the positive net profit margin of firms may not be achieved by having more capital. Firm borrowings have reduced profit growth, which is in line with some previous studies such as Le & Phan (2017), and Efobi et al. (2016). The reason behind this may be a high cost of debt contributing to the existing financial difficulties that firms' sales may not be enough to compensate for, which can relate to the debt-overhang problems that limit further credit extension (Banerjee, 2014).

4. 2. Robustness check

In this subsection, we check the robustness of our results with the use of a variation of our constructed FI index. Specifically, using a non-weighting method by Sarma (2016), we compute another index with data obtained in three dimensions: Penetration, Availability and Usage. After that, we re-estimate Equation (1) to (4) to see if our key results still hold when our FI is calculated this way. We report obtained results in Table 4.

Table 4. Robustness check with a non-weighted FI index

Dep. Var.	*ROA*						*Corp_borrow*	
	(4.1)	**(4.2)**	**(4.3)**	**(4.4)**	**(4.5)**	**(4.6)**	**(4.7)**	**(4.8)**
	OLS	**FE**	**OLS**	**FE**	**OLS**	**FE**	**OLS**	**FE**
$log\ (Fin\_inc)$			-0.022***	-0.038***	-0.022***	-0.036***	0.049***	0.103***
			(0.002)	(0.003)	(0.002)	(0.003)	(0.001)	(0.003)
$Corp\_borrow$	-0.011***	-0.025***			-0.009***	-0.019***		
	(0.003)	(0.006)			(0.003)	(0.006)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	294,259	294,259	294,259	294,259	294,259	294,259	294,259	294,259

*Notes: Robust standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1. Control variables include: Firm age, Firm type, and Firm size.*

From Table 4, it can be seen that the coefficients of both financial inclusion and corporate borrowing variables are negative and highly significant, at 1% level, in both OLS and fixed effect regressions. This result is consistent with what was obtained previously for the baseline model. This helps to affirm the reliability of the FI index that we have calculated as well as the findings about the nexus between FI and returns on assets of ICT firms.

5. Conclusion

In this study, we have analyzed the impact of financial inclusion on firm performance and whether corporate borrowings are an effective channel of the impact. For that purpose, we constructed an index of FI for Vietnam, spanning the 2008-2018 period. Upon combining this index with a rich dataset that covers more than 200,000 ICT firms in Vietnam over the same period, we found that FI exerts a total negative effect on the returns on assets of firms. This effect works in two dimensions, either directly or via corporate borrowings. Here, FI promotes corporate borrowings by enabling firms' access to the financial sector. Because borrowings negatively affect returns on assets, the indirect effect of FI is negative. We also found that while corporate borrowings enlarge firm sales, they fail to keep up the profit margin with the changing sales. They are also robust to alternative model specifications such as OLS, and fixed-effect estimations and an alternative of constructing the FI index.

Our paper contributes to different strands of literature looking at either the economic impact of FI or that of bank finance by making an important first step in linking them together in an

integrated analytical framework. We have established that FI, besides having a direct effect, affects firm performance via corporate borrowings.

Our results have important policy implications for the government, academic researchers and industry practitioners wishing to design programs and policies to help firms obtain financial resources necessary for their development. In that respect, our findings are highly relevant for developing countries at a similar stage of development to Vietnam that aim at improving the resilience of technology-based firms. Given that FI can affect firm performance, it is important to forecast the impacts of this factor so that developing countries can pursue every opportunity to reduce any harmful impacts and increase benefits of their financial policy.

Acknowledgement

This study is part of the students' research program funded by Foreign Trade University.

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Appendix.

A1. Results of FI dimensions and total index

Year	Y_t^p	Y_t^u	Y_t^a	$\widehat{Fin\_inc}$	Fin_inc	$log\ (Fin\_inc)$
2008	-2.385	0.387	-0.134	-1.860	0.010	-4.632
2009	-1.371	1.536	0.178	-0.832	1.038	0.038
2010	-1.448	0.472	0.101	-1.085	0.785	-0.242
2011	-1.266	-0.479	0.223	-1.106	0.764	-0.269
2012	-1.295	-0.152	-0.314	-1.078	0.792	-0.233
2013	-0.727	-1.130	-0.022	-0.790	1.080	0.077
2014	-0.153	-1.187	-0.024	-0.336	1.534	0.428
2015	0.275	-0.494	0.220	0.137	2.007	0.696
2016	1.058	-0.052	0.118	0.847	2.717	1.000
2017	1.106	0.429	-0.438	0.965	2.835	1.042
2018	1.674	-0.008	-0.043	1.351	3.221	1.170

A2. Detailed description of financial inclusion components

Variable	Definition	N	Mean	Std. Dev.
Usage dimension (Y_t^u)				
Bank deposit	Outstanding deposits with commercial banks (% of GDP)	13	0.406	0.311
Other loans	Outstanding loans with other deposit takers (% of GDP)	13	0.388	0.279
Other deposits	Outstanding deposits with other deposit takers (% of GDP)	13	0.629	0.345
Availability dimension (Y_t^a)				
Bank branches	Branches of commercial banks	13	0.498	0.357
ATMs	Number of ATMs	13	0.549	0.348
Other branches	Branches of other deposit takers	13	0.294	0.318
Access dimension (Y_t^p)				
Deposit accounts	Number of deposit accounts with credit unions and credit cooperatives per 1,000 adults	13	0.460	0.334
Debit cards	Number of debit cards per 1,000 adults	13	0.616	0.336
Loan accounts	Number of loan accounts with credit unions and credit cooperatives per 1,000 adults	13	0.518	0.386