

Article

The Causal Effect of Access to Finance on Productivity of Small and Medium Enterprises in Vietnam

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Abstract: In many developing countries, obtaining financial services at affordable rates and fair terms has been a significant challenge for small and medium enterprises (SMEs). However, this issue has not been paid much attention in Vietnam, even though SMEs account for about 95% of total enterprises and the financial market of the country has not been well developed. This study investigates the causal effects of access to finance on productivity of SMEs operating in the manufacturing sector in Vietnam. Productivity was measured as the total factor productivity (TFP) obtained by production function estimation using the Levinsohn and Petrin approach. Regarding financial accessibility, two factors covered the extent to which firms might have a bank loan or overdraft facility were employed. To study the causal inferences of access to finance on firm productivity, the research adopted the difference-in-differences (DID) approach, as well as the propensity score matching (PSM) coupled with DID technique. The empirical results indicated that improving the financial accessibility could directly enhance firm productivity. Particularly, it was shown that firms having access to a bank loan could significantly improve TFP by approximately 8.6% in the DID model and about 9% in the PSM-DID model. Meanwhile, the firm average TFP increased by approximately 12.3% and 15.7% in simple DID and PSM-DID models, respectively, when firms had an overdraft facility. These findings suggest that the government should put more effort into assisting SMEs in generating bankable projects, and create a sound and healthy financial environment to stimulate firms' access to finance, which will ensure their sustainability and growth.

Keywords: access to finance; total factor productivity; Vietnamese small and medium enterprises; difference-in-differences; propensity score matching

1. Introduction

Access to finance is associated with the ability of enterprises to obtain financial services [1]. It is acknowledged as an important factor in promoting firm sustainability and growth through financing both existing and new investment projects. In practice, firms will invest in projects where the expected benefits exceed the costs, however, an efficient investment is achieved only when the firms do not face credit obstacles unrelated to their own performance [2]. From a theoretical viewpoint, it is argued that firms can finance their operations and growth in many different ways. However, both internal and external funds are not perfectly substituted due to a number of reasons, such as transaction

costs, tax advantages, agency problems, costs of financial distress, and asymmetric information. Furthermore, different enterprises have uneven access to capital markets. Since the capital markets in many developing economies have not been well-developed, firms in these countries, particularly small and medium enterprises, may face significant challenges in obtaining financing and other banking services at affordable rates and fair terms. From an empirical viewpoint, existing studies generally confirm that firms in developing countries often cite financial constraints as the main obstacle to their growth [3–7]. However, some evidence suggests that the development of the financial sector may not necessarily lead to a positive outcome in terms of growth for firms [8–11]. Therefore, it is essential to study the impact of financial accessibility on firm growth, and investigate whether or not firms' access to external finance can improve their performance.

One possible channel through which financial accessibility may affect firm growth is via improvement in productivity. It is theoretically shown that a well-developed financial system creates more investment opportunities and allocates resources to the most profitable firms [12]. This can be beneficial to firm productivity as a result of higher technological specialization through diversification of risk. In addition, higher capital intensity and technical progress embodied in new equipment will also have a positive influence on productivity. From the empirical viewpoint, most of the relevant existing studies conclude that better access to finance boosts firms' productivity [11,13–15]. Furthermore, it was shown that many productive firms were not able to expand or make the technological improvements and investments needed to increase their productivity because they have no access to credit [16,17]. However, despite the above consistent results, there still have been challenges when studying the relationship between financial accessibility and firm productivity. It is argued that the proper interpretation of regression coefficients relating these two variables is often hindered by the reverse causality and endogeneity issues [18]. To specify, the positive association between financial accessibility and firm productivity can be interpreted in many different ways. On the one hand, a more productive firm tends to seek additional finance from financial institutions. On the other hand, increased access to financial services can enhance firm productivity. Yet another alternative interpretation is that there exist unobservable factors which may affect both firms' financial accessibility and productivity. Therefore, it is difficult to estimate the direct or true effects of financial accessibility on firm productivity. One potential solution is to consider an exogenous shift in the firms' access to finance. In practice, the causal effect analysis allows us to address the above issues.

This research aims to explore the causal effect of access to finance on firms' TFP of SMEs operating in the manufacturing sector in Vietnam. It contributes to the existing literature by addressing two major issues. First, the previous studies often test the hypothesis that "Financial accessibility positively associated with the firm productivity" but this relationship is likely to meet the self-selection bias resulting from access to finance decisions and confounding by unobservables. If this problem could not be controlled, the true effects of the issue might be overestimated or underestimated [19]. Therefore, in this study, besides testing the above hypothesis, we attempt to answer the question "Does the firm with access to finance are more productive than those without". To do that, multiple identification strategies were adopted to estimate the causal effects between access to finance and productivity through comparing two groups of firms: (i) firms that did not have access to financial services in the period 0 but were able to obtain the services in period 1 and (ii) firms that did not have access to finance in both periods. To specify, a difference-in-difference (DID) approach was used to estimate the impact of access to finance on firm productivity. In addition, propensity score matching (PSM) coupled with DID was employed to more closely match the treatment and control group of firms and re-examine the DID specification. This method allowed us to mitigate the unobserved effects of confounding. Another problem faced by the prior works is how to obtain unbiased of TFP in the presence of endogeneity [20]. In this study, to deal with this issue, TFP was estimated from the production function by applying the Levisohn and Petrin [21] approach.

There are several reasons for considering Vietnamese firms as the ideal setting to conduct this study. First, Vietnam has a moderately developed financial sector. In 2017, it was ranked 71st for

financial market development by the World Economic Forum [22]. Although the country witnessed rapid credit growth over the past decade, the financial market development has still been low and the banking system has been relatively weak compared to other developing countries. In particular, the soundness of Vietnamese banks ranked 112th among 137 countries, while the management of the stock market ranked 89th [22]. Second, SMEs play a vital role in the development of the Vietnamese economy as they accounted for about 95% of total enterprises, employed 77% of the labor force [23] and contributed approximately 48% of the country's Gross Domestic Product (GDP) in 2012 [24]. However, the fact is that a large number of SMEs in Vietnam are still faced with challenges in accessing finance and credit. A SME survey of the Ministry of Planning and Investment (MPI) [24] showed that approximately 30% of SMEs in Vietnam did not have access to financing from financial institutions, while the other 30% did, but faced numerous difficulties in obtaining funds. Another report by CIEM [25] revealed that a lack of capital and access to credit was one of the most serious obstacles to SMEs in Vietnam. The survey indicated that the businesses' ability to access financing fell from 45% in 2011–2013 to 24% in 2015. Furthermore, nearly 70% of 2500 surveyed SMEs had to seek loans on the black market, as they were unable to approach the formal finance sector. According to OECD/ERIA [26], Vietnam had a score of 3.81 for the access to finance dimension, which was lower than the average of all ASEAN countries (4.15). The important question is whether these financial constraints faced by SMEs affect their performance, particularly productivity. Therefore, understanding the relationship between access to finance and firm productivity may yield important policy implications. Third, despite the importance of the issue, this topic has not been widely researched for the case of the Vietnamese SMEs. From the methodological aspect, most of the existing studies were principally based on traditional estimation techniques and correlation analysis, which might lead to selective problems. To our knowledge, the present paper is the first to investigate the importance of access to credit for firm productivity using causal methods in Vietnam. Furthermore, results of this study may yield important policy for not only Vietnam but also other developing economies that depend largely on the SMEs and the manufacturing sector. If there exists a direct and significant association between access to finance and firm productivity, it may suggest a solution to improve productivity at micro level.

Drawing on a dataset of 1608 Vietnamese manufacturing SMEs in 2013 and in 2015, after controlling for determining factors and observable time-variant factors that might simultaneously influence the decision to access to finance and firm productivity, the empirical results showed that by using financial services, firms could significantly improve their productivity.

The rest of the paper is organized as follows: Section 2 presents the measurement of access to finance and firm productivity. In Section 3, the methodologies used to investigate the causal inferences of financial accessibility and firm productivity will be discussed. Section 4 demonstrates the empirical results of the study followed by a discussion in Section 5. Section 6 concludes the paper.

2. Methodology

2.1. Measurement of Variables

2.1.1. Measurement of Firm Productivity

Productivity is defined as a ratio of output to a measure of input [27]. In practice, to measure productivity, there are two principal options, which are (i) partial factor productivity (PFP), and (ii) total factor productivity (TFP). PFP is defined as a ratio between output and a specific input factor (capital or labor). On the other hand, TFP is defined as a ratio of the output produced to an index of composite inputs. In other words, it is the weighted average capacity of all inputs [28]. To measure TFP, there are two main options: non-parametric approaches (TFP index, data envelopment analysis) and parametric approaches (estimation of the production function, stochastic frontier analysis). Regarding the estimation of the production function, there are several techniques available: the OLS estimation, the Olley and Pakes [29] method, and the Levinsohn and Petrin [21] approach. However, in practice, it is argued that the OLS technique may lead to biased estimates of productivity because the

estimation suffers from the endogeneity of input choices and selection bias [20]. Therefore, the latter two approaches are frequently applied. In this paper, following the study of Giang [30], productivity was measured as the TFP obtained from the production function estimated by Levisohn and Petrin [21] approach. The main idea behind this approach is that an intermediate input could be used as a proxy for the unobserved firm productivity and unbiased estimates of the production function.

2.1.2. Measurement of financial accessibility

Regarding the firms' financial accessibility, in this study, we focused on the ability to get formal credit (i.e., access to credit) from a financial institution. In particular, it was measured using two different bilateral indicators. The first variable covered the extent to which firms may have loan from a financial institution. It took the value of 1 if the firm obtained a bank loan by the end of the survey year and a value of 0 otherwise. The second measure of access to finance took into account whether the firm had access to an overdraft facility to finance its operations or not. The response was 1 if the firm had such access and 0 otherwise.

2.2. Identification Strategies

To deal with the self-selection bias faced by traditional estimation techniques and correlation analysis, this study employed multiple identification strategies to analyze the causal effects of access to finance on firm productivity. A causal effect is the average effect of a binary variable on an outcome variable of scientific or policy interest. To understand the problem when estimating causal effect, let Y_i^T and Y_i^C are potential productivity (the outcome) for firm i when it obtains (treated group) or does not obtain (control group) credit from a financial institution. At time t , if firm i has access to financial services, then the productivity at $t+1$ is Y_i^T . However, if i did not obtain credit, the potential productivity for i at $t+1$ is Y_i^C . Conceptually, the effect of financial accessibility can be simply written as $Y_i^T - Y_i^C$. Yet, because it is impossible for i to simultaneously obtain (Y_i^T) and not obtain (Y_i^C) credit, the problem is how to reconstruct the counterfactuals (i.e., the outcomes that are not observed, that is, what if firm i does not obtain credit?). To do that, the aggregated treatment effects are often employed [31,32]. There are two options of aggregated treatment effects: the average treatment effect (ATE) and the average treatment effect on the treated group (ATT). The ATE is defined as the average effect that would be found if every individual in the treated and the control groups received treatment, compared with if no one in both groups received treatment [33]. On the other hand, the ATT refers to the average difference that would be observed if everyone in the treated group received treatment compared with if none of these individuals in the treated group received treatment. In this study, the ATT was used. The definition of ATT can be expressed as:

$$ATT = E(Y_i^T | T_i = 1) - E(Y_i^C | T_i = 1) \quad (1)$$

where $E()$ is the expectation in the population. T_i takes the value of 1 for the treated group and the value of 0 for the control group.

In this study, two different methods were applied to calculate the ATT. The first one is the DID approach which compares outcome differences between two groups of firms: (i) firms that did not have access to financial services in the period 0 but were able to obtain the services in period 1, and (ii) firms that did not have access to finance in both periods. Second, PSM coupled with DID were used to more closely match the treatment and control group of firms and re-examine the difference-in-difference specification. The method took into account whether or not the presence of confounding and time-dependent factors simultaneously impact on firms' access to finance and firm productivity.

2.2.1. Simple Difference-In-Differences (DID) Model

DID methods identify causal inferences by comparing the change in outcomes of the treatment and control groups before and after the intervention happens [34,35]. This method assumes that, without intervention, the average outcomes for the treated and control groups would have followed parallel trends over the same period [36]. This assumption allows the time-invariant unobserved difference of the averages of counterfactual outcomes across these groups [37]. Thus, omitted variable bias due to unobserved variables that are time-invariant or constant across units of observation can be eliminated [36,38,39].

In this study, the DID model estimated the causal impact of access to finance on TFP using data for two years: 2013 and 2015. Instead of directly analyzing the impact of finance on productivity, the research examined differences in the productivity of firms with credit supplies and firms without. In particular, the study considered two groups: firms that did not have access to financial services in 2013 but were able to obtain the services in 2015 and firms that did not have access to finance in both periods, and observed the before-and-after changes in outcome variable (i.e., firm productivity).

DID technique measures ATT as the difference between the changes in the outcome variable (firm TFP) of treatment and control groups over the same time. Consider a two-period setting where $t = 2013$ represented the period before intervention and $t = 2015$ represented the period after intervention. Let Y_t^T and Y_t^C be the outcomes for a treated group and a control group in year t , respectively. The DID method will estimate the average treatment impact as follows:

$$DID = ATT = E(Y_{2015}^T - Y_{2013}^T | T_1 = 1) - E(Y_{2015}^C - Y_{2013}^C | T_1 = 0) \quad (2)$$

where $T_1 = 1$ denotes firms accessing to finance at 2015 whereas $T_1 = 0$ denotes firms without credits.

However, instead of manually taking the difference of the outcomes as shown in the above equation, the DID in this study was implemented using a regression. Following Ravallion [40], the DID estimate can be calculated as follows:

$$Y_{ft} = \alpha + \delta^{DD} T_{ft,t} + \lambda^{DD} X_{ft} + \mu_{it} \quad (3)$$

where Y_{ft} is the outcome variable, t is a treatment-year dummy that $t = 0$ if the year is 2013 and $t = 1$ if the year is 2015, T_{ft} is a treated-group dummy that $T_{ft} = 1$ if the firms access to credit in 2015 and $T_{ft} = 0$ of firms with no access to credit in 2013 and 2015. The DID treatment effect estimator is represented by coefficient δ^{DD} . Variable X_{ft} is a set of control variables.

2.2.2. PSM Coupled with DID (PSM-DID)

The DID method assumes a common trend between the treatment and control groups, particularly in this study, between firms with access to finance and firms without, and years pre- and post-credit supply. This assumption is completely satisfied when the treatment assignment is random. However, in the context of this study, the condition is unlikely to hold, as it is difficult to suppose that firms have access to finance randomly. Therefore, DID coupled with PSM technique is utilized to deal with potential bias from non-random assignment and confounding from unobserved factors. Particularly, the propensity score can mitigate the heterogeneity between the productivity in treatment and control groups that arises due to self-selection bias [41]. PSM picks each participant matched to a nonparticipant that is similar in specific observed characteristics. Regarding characteristics used in matching firms with firm productivity being outcome variable, one of the most frequently cited factors in the literature is firm size. In a study on credit constraints in four African countries, Bigsten et al. [42] found that firm size was a significant determinant in obtaining finance with the probability of accessible successes of micro-, small-, and medium-sized firms were 31%, 20%, and 13%, respectively, and were higher than that of large firms. Arellano et al. [43] observed in less financially developed economies and found that small firms grew faster than large firms. The findings also illustrated that financial market development

is important in explaining quantitatively the difference in growth rates across firms. Together with firm size, firm age has also been widely recognized as a significant determinant of accessibility to financing. Young firms meet obstacles in accessing to external finance due to inexperience [44], informational disparities [45,46]. Furthermore, Vietnamese firms participating in export experienced difficulties to access credit as suggested in Vo et al. [47]. Another important factor is bribery that may take place during the lending process through bribing bank officials [48]. It was shown that bribery plays a crucial role in determining the ability of firms to access to financial services [49–51]. The previous papers also included sector and export as dummy variables to test whether there is a difference in accessibility to finance between export and non-export enterprises. Given the factors used in the preceding literature, in this study, firm size, firm age, export, bribe and a sector dummy were used as covariates when estimating propensity score for matching firms.

Furthermore, for the matching procedure, the study employed nearest neighbor matching approach, in which each treatment firm was matched to the comparison firm in terms of the closest propensity score. According to Heinrich et al. [52], the nearest neighbor matching is excellent in terms of bias reduction because it uses the most similar control observation to match. After propensity scores had been estimated and a matching algorithm had been chosen, the DID estimate was computed to examine the impact of the financial accessibility on firm TFP. Unlike the cross-sectional PSM that concentrates on the differences in the outcome variable between the similar enterprises in treatment and control groups, the advantage of DID coupled with PSM is that it compares the changes over time between them. Furthermore, PSM-DID can eliminate the observations whose counterfactuals scarcely exist and, hence, the balance between the treatment and comparison groups can be achieved.

The PSM-DID estimator can be expressed as follows [34]:

$$ATT_{PSM}^{DD} = \frac{1}{N^T} \left[\sum_{f \in T} (Y_{f,2015}^T - Y_{f,2013}^T) - \sum_{f \in C} \pi_f (Y_{f,2015}^C - Y_{f,2013}^C) \right] \quad (4)$$

where ATT is the average treatment effect on the treated, N^T is the number of sample in treated group, T and C are the sets of firms in treatment and control groups respectively, $Y_{f,t}^T$ and $Y_{f,t}^C$ are the TFP at time t for firms in treatment and controlled groups, respectively, and π_f is a weight attached to each firm in the control group. In the case of this study, π_f is equal to 1 for those firms in the control group that are matched, and 0 for those that are not matched.

In term of regression, PSM-DID employed a regression-adjusted estimator to estimate the ATT_{PSM}^{DD} , applying weights on the basis of the propensity score to the matched comparison group as follows:

$$\Delta Y_{ft} = \alpha + \delta_{PSM}^{DD} T_{ft} + \lambda_{PSM}^{DD} \Delta X_{ft} + \mu_{it} \quad (5)$$

where ATT_{PSM}^{DD} is indicated by coefficient δ_{PSM}^{DD} . ΔY_{ft} is the outcome variable change over time. ΔX_{ft} is a set of control variables.

3. Data

To investigate the direct relationship between access to finance and firm productivity, this study employed data of the SMEs operating in the manufacturing sector in Vietnam. There are several reasons for considering the SMEs and the manufacturing sector as the ideal setting to conduct the analysis in this study. First, as mentioned in the previous section, SMEs play a vital role in the development of the Vietnamese economy (account for 95% of total enterprises, employed 77% of the labor force and contributed approximately 48% of the country's GDP in 2012). However, most of the SMEs in Vietnam are still faced with challenges in accessing finance and credit. Second, manufacturing sector is acknowledged as one of the major contributors to Vietnam's GDP growth. Manufacturing share of GDP subsequently climbed steadily to 25% in 2009, surpassing the share of agriculture in 2003 [53]. Furthermore, the study employed the Levisohn and Petrin [21] approach to calculate the firm TFP by

using the intermediate inputs could as a proxy for the estimates of the production function. In practice, these intermediate input data is available for manufacturing firms.

The source of data used in this study is the Vietnamese SMEs survey collected in 2013 and 2015. The survey was from a project under the collaboration of the Central Institute for Economic Management (CIEM) of the Ministry of Planning and Investment of Vietnam, the Institute of Labor Science and Social Affair (ILSSA), and the Development Economics Research Group (DERG) of the University of Copenhagen [54]. It tracked over 2500 SMEs operating in the manufacturing sector in nine provinces in Vietnam. The survey provided detailed information on enterprise history, owner background characteristics, firm performance, employment, investment and access to finance. It also covers firms in 18 manufacturing sectors and can be divided into six broad categories: (1) Food and beverages, (2) Non-metal and plastic materials, (3) Metal and machinery products, (4) Wood products and furniture, (5) Textiles, and (6) Others [30]. Each firm in the survey was provided with a code that remained unchanged over years, which allowed us to generate a balanced panel dataset following individual firms. Before the analysis, some parts of the sample were dropped since some variables were not available in both years for all firms. The final data formed a balanced panel dataset of 1608 enterprises that were mobile in the manufacturing sector from 2013 to 2015. Tables 1 and 2 show the numbers of surveyed firms and the information on the status of financial accessibility in 2013 and 2015.

Table 1. Sample bank loan and number of firms transformed by years.

		Bank Loan in 2015				
		No		Yes		Total
Bank Loan in 2013	No	951 (82.1)	(82.7)	199 (44.2)	(17.3)	1150 (71.5)
	Yes	207 (17.9)	(45.2)	251 (55.8)	(54.8)	458 (28.5)
	Total	1158	(72)	450	(28)	1608

Values reported in parentheses are the percentages of firms.

Table 2. Sample overdraft facility and number of firms transformed by years.

		Overdraft Facility in 2015				
		No		Yes		Total
Overdraft facility in 2013	No	1084 (98.6)	(85.5)	184 (36.1)	(14.5)	1268 (78.9)
	Yes	15 (1.4)	(4.4)	325 (63.9)	(95.6)	340 (21.1)
	Total	1099	(68.3)	509	(31.7)	1608

Values reported in parentheses are the percentages of firms.

In particular, this study compared two groups of firms: (i) firms that switch from “having no financial accessibility” in 2013 to “having financial accessibility” in 2015 (treatment group) and (ii) firms remain having no financial accessibility in the both two years (control group). To specify, with respect to bank loans, there were 1150 firms (out of 1608 firms) that did not have any bank loans in 2013 (Table 1). Of which, 199 firms reported that they obtained a bank loan in 2015 while the remaining 951 firms did not change their status (Table 1). Regarding overdraft facility, the analyses focused on 184 firms in the treated group and 1084 firms in the control group (Table 2).

4. Results

4.1. Summary Statistics

Table 3 provides detailed description and summary statistics of all variables. The natural logarithm of each TFP variable was taken in all models and used as a dependent variable. First, the table showed that TFP in 2013 was considerably higher than that in 2015 (4.3 compared with 2.7, respectively). Meanwhile, access to finance status includes two independent variables: Bank loan (LOAN) and overdraft facility (OVER). The mean value of former variables witnessed an increase from 28.4% in 2013 to 27.9% in 2015, while that of the latter showed a slight decrease from 21.1% to 31.6% during this period. In all estimations, we also included the firm-specific factors (characteristics of the firm itself) and external environment factors that affected firms' economic performance. The benchmark for selecting these firm specific and investment climate variables follows the studies of Giang et al. [30], Bastos and Nasir [55], Escribano and Guasch [56], Dollar et al. [57], and Kinda et al. [58]. To be more specific, we imposed a set of firm-specific variables: firm size, age, and export. Regarding the external environment factors, several investment climate variables, including electric supply (ELE), Internet usage (ITN), uneducated employees (EDU), and bribe (BRI), were employed. It was showed that the amount of firms that did not have access to Internet in 2013 is higher than that in the following two years (63% and 53.2%, respectively) while the mean values of other variables remained stable over time.

Table 3. Summary statistics.

Variables	Description	Total		2013		2015	
		Mean	SD	Mean	SD	Mean	SD
TFP	Total Factor Productivity (in logs)	3.484	1.012	4.297	0.595	2.672	0.612
MICRO	Dummy variable for micro firms (=1 if the number of employees is less than 10)	0.720	0.448	0.713	0.452	0.727	0.445
SMALL	Dummy variable for small firms (=1 if the number of employees is equal to or larger than 10 and smaller than 50)	0.215	0.411	0.223	0.416	0.208	0.406
AGE	Number of years since the firm established (in logs)	2.629	0.609	2.547	0.661	2.710	0.541
EXP	Dummy variable for export (=1 if the firm exported their products)	0.074	0.262	0.068	0.252	0.080	0.271
ITN	Dummy variable for internet access (=1 if the firm had no internet access)	0.581	0.493	0.630	0.482	0.532	0.499
ELE	Dummy variable for electricity (=1 if the firm experienced insufficient power for production in the survey year)	0.011	0.108	0.023	0.151	0.000	0.000
EDU	The percentage of workers who do not have at least a college or university degree	0.963	0.071	0.959	0.071	0.968	0.070
BRI	Dummy variable for bribe (=1 if firm paid informal or communication fee)	0.489	0.499	0.496	0.500	0.481	0.499
OVER	Dummy variable for overdraft facility (=1 if the firm reports that it did not have an overdraft facility)	0.263	0.440	0.211	0.408	0.316	0.465
LOAN	Dummy variable for bank loan (=1 if the firm reports that it did not have a bank loan)	0.282	0.450	0.284	0.451	0.279	0.449
Total observations		3216		1608		1608	

SD: Standard Deviation.

Next, in Tables 4 and 5, an unconditional t-test was applied by accessibility status to check the mean differences of all selected variables of firms having financial accessibility and those without in each year (panel A). The average changes between the treatment and control groups were also compared in panel B of the two tables. The results showed that there could be imbalances in the

observed covariates, suggesting the existence of endogenous selection in both statuses of bank loan and overdraft accessibility. To be more specific, this simple comparison of average changes showed that firms having financial accessibility were larger than those without, while there was no remarkable difference between firm ages when having finance or not. Meanwhile, the former also tended to export products more than the latter. In addition, the treated firms presented significantly higher mean values of environmental factors than the control units, suggesting that the former might be located in supported investment areas than the latter. Regarding the outcome variables, Tables 4 and 5 showed that financial accessible firms were more considerably productive than inaccessible ones in both panel A and B. However, these simple comparisons of averages did not consider other factors. Indeed, a serious challenge for researcher when considering the relationship between dependent and independent variables is that there might be self-selection due to the endogeneity problem. For a given firm, it is likely that unobservable indicators correlated with the ability to access finance also impact the scale of firm productivity growth, such as factors that are intrinsic to the firms. For instance, firms having high inherent ability are likely to expend scale by access to finance, while it might be that their performance is higher than those with low intrinsic value. Another situation through which the estimation may be biased is when the determining factors that have an effect on the choice of finance access also influence the outcome differences. To illustrate, if a policy of finance stimulation is applied on the areas that have healthy financial markets, it is possible that the firm productivity growth results from ideal geography instead of this policy. In addition, the bias may occur due to time-dependent confounders when the applied policy in parallel with the changing of economic conditions that are correlated with the productivity difference. Therefore, it is necessary to reduced selection bias by more appropriate models.

Table 4. Summary statistics (bank loan status).

	Bank Loan in 2013			Bank Loan in 2015		
	Yes	No	Diff	Yes	No	Diff
Panel A: All Firms						
TFP	4.351	4.276	0.075 **	2.689	2.665	0.023
MICRO	0.519	0.790	−0.270 ***	0.540	0.800	−0.260 ***
SMALL	0.327	0.181	0.145 ***	0.326	0.162	0.164 ***
AGE	2.514	2.561	−0.050	2.638	2.738	−0.100 ***
EXP	0.122	0.046	0.075 ***	0.140	0.056	0.083 ***
ITN	0.471	0.693	−0.222 ***	0.371	0.594	−0.223 ***
ELE	0.028	0.021	0.006	0.000	0.000	0.000
EDU	0.943	0.965	−0.022 ***	0.955	0.973	−0.017 ***
BRI	0.650	0.435	0.215 ***	0.544	0.457	0.086 ***
Total observations	458	1150		450	1158	
	Bank loan in 2013			Bank loan in 2015		
	Yes	No	Diff	Yes	No	Diff
Panel B: Initially No Bank Loan (Firms Do Not Have Bank Loan in 2013)						
TFP				3.544	2.706	0.837 ***
MICRO				0.673	0.810	−0.136 ***
SMALL				0.271	0.163	0.108 ***
AGE				2.649	2.642	0.007
EXP				0.090	0.045	0.045 ***
ITN				0.452	0.661	−0.209 ***
ELE				0.000	0.011	0.011
EDU				0.967	0.969	−0.002
BRI				0.512	0.444	−0.068
Total observations				199	2101	

Values reported in parentheses are robust standard errors (SE); *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Diff: Difference.

Table 5. Summary statistics (overdraft facility status).

	Overdraft Facility in 2013			Overdraft Facility in 2015		
	Yes	No	Diff	Yes	No	Diff
Panel A: All firms						
TFP	4.435	4.260	0.174 ***	2.803	2.611	0.192 **
MICRO	0.338	0.813	−0.475 ***	0.387	0.885	−0.498 ***
SMALL	0.491	0.151	0.339 ***	0.434	0.103	0.330 ***
AGE	2.309	2.611	−0.302	2.527	2.795	−0.268 ***
EXP	0.152	0.045	0.107 ***	0.194	0.027	0.167 ***
ITN	0.202	0.745	−0.542 ***	0.094	0.735	−0.640 ***
ELE	0.035	0.020	0.014 ***	0.000	0.000	0.000
EDU	0.909	0.972	−0.063 ***	0.926	0.987	−0.061 ***
BRI	0.735	0.432	0.302 ***	0.762	0.352	0.410 ***
Total observations	340	1268		509	1099	
	Overdraft facility in 2013			Overdraft facility in 2015		
	Yes	No	Diff	Yes	No	Diff
Panel B: Initially No Overdraft Facility (Firms Do Not Have Overdraft Facility in 2013)						
TFP				3.497	3.464	0.032
MICRO				0.461	0.891	−0.429 ***
SMALL				0.437	0.099	0.338 ***
AGE				2.447	2.697	−0.249 **
EXP				0.138	0.024	0.114 ***
ITN				0.174	0.773	−0.598 ***
ELE				0.014	0.009	0.04
EDU				0.923	0.982	−0.058 ***
BRI				0.753	0.366	0.386 ***
Total observations				498	1802	

Note: Values reported in parentheses are robust standard errors (SE); *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Diff: Difference.

4.2. The Correlation between Financial Accessibility and Firm TFP

To investigate the relationship between financial accessibility and firm TFP, first, the Ordinary Least Square (OLS) and fixed effects (FE) models were applied. Table 6 shows the relationship between loan accessibility and TFP while the link between overdraft facilities and firm TFP was reported in Table 7. In these two tables, columns A1, A2, and A3 examine all firms in the period 2013–2015 while columns B1 and B2 focus on firms that did not have access to finance in 2013. The results using OLS models are reported in columns A1 and A2 and FE estimates are presented in columns A3. In column A1 and B1, only firm specific factors (firm size, firm age and export) were included as the control variables in the regression. In column A2 and B2, a full set of variables consisting of both firm specific factors and environmental controls (infrastructure, labor skill, regulation) was added.

Regarding loan accessibility, the results of all five columns show that there is a positive association between obtaining a bank loan and firm TFP. However, this link is negligible in first two columns. As mentioned in the previous section, column B1, B2 of Table 6 are focused on 1150 firms that did not have access to bank loan in 2013, and compare the differences in TFP between 199 firms in the treated group and that of 951 firms in the control group. The results of column B1 and B2 illustrate that having bank loan positively correlated with TFP by approximately 8.6% and 8.2% ($p > 0.1$, Table 6).

Table 6. TFP and bank loan, OLS and FE estimation.

	A1	A2	A3	B1	B2
	LnTFP OLS	LnTFP OLS	LnTFP FE	LnTFP OLS	LnTFP OLS
LOAN	0.0253 (0.0412)	0.0312 (0.0407)	0.0883 (0.0690)	0.0862 (0.0714)	0.0819 (0.0711)
MICRO	0.1385 * (0.0820)	0.0820 (0.0850)	0.1546 (0.2322)	−0.0625 (0.1277)	−0.1128 (0.1302)
SMALL	0.1487 * (0.0821)	0.1160 (0.0813)	0.2192 (0.2053)	0.0074 (0.1300)	−0.0396 (0.1291)
AGE	−0.2791 *** (0.0294)	−0.2807 *** (0.0294)	−3.4766 *** (0.1369)	−0.2922 *** (0.0322)	−0.2940 *** (0.0323)
EXP	0.0347 (0.0738)	0.0705 (0.0732)	−2.2497 (0.1864)	0.2044 ** (0.1000)	0.2200 ** (0.0993)
BRI	0.1194 *** (0.0371)	0.1355 *** (0.0372)	0.0609 (0.0575)	0.0266 (0.0422)	0.0326 (0.0423)
ITN		0.2634 *** (0.0457)	0.9172 *** (0.1136)		0.1802 *** (0.0520)
ELE		0.8508 *** (0.1605)	0.8027 *** (0.2293)		0.8904 *** (0.1904)
EDU		−1.6986 *** (0.2787)	−1.3281 *** (0.4437)		−1.3674 *** (0.3285)
Constant	4.0038 *** (0.1203)	5.5108 *** (0.2801)	13.0972 *** (0.6828)	4.2993 *** (0.1594)	5.5432 *** (0.3424)
Observations	3216	3216	3216	1150	1150
R-squared	0.0384	0.0634	0.0369	0.1003	0.1182

Note: Values reported in parentheses are robust standard errors (SE); *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. OLS: Ordinary Least Square. FE: Fixed effects.

Table 7. TFP and overdraft facility, OLS and FE estimation.

	A1	A2	A3	B1	B2
	LnTFP OLS	LnTFP OLS	LnTFP FE	LnTFP OLS	LnTFP OLS
OVER	0.0911 (0.0470)	0.0824 (0.0494)	0.0616 *** (0.1019)	0.0845 *** (0.0781)	0.0821 *** (0.0800)
MICRO	0.0380 (0.0831)	0.0203 (0.0846)	0.1632 (0.2294)	−0.0798 (0.1187)	−0.1161 (0.1208)
SMALL	0.1185 (0.0817)	0.0938 (0.0809)	0.2280 (0.2030)	−0.0082 (0.1207)	−0.0507 (0.1201)
AGE	−0.2941 *** (0.0295)	−0.2886 *** (0.0294)	−3.3173 *** (0.1380)	−0.2586 *** (0.0994)	−0.2565 *** (0.0314)
EXP	0.0569 (0.0738)	0.0831 (0.0731)	−1.1848 (0.1847)	0.1712 * (0.0994)	0.1906 * (0.0990)
BRI		0.1550 *** (0.0374)	0.0946 * (0.0570)	0.1995 *** (0.0404)	0.2019 *** (0.0405)
ITN		0.2109 *** (0.0476)	0.8624 *** (0.1127)		0.1845 *** (0.0522)
ELE		0.8596 *** (0.1601)	0.8338 *** (0.2269)		0.6825 *** (0.1882)
EDU		−1.8300 *** (0.2804)	−1.1558 *** (0.4396)		−1.6318 *** (0.3444)
Constant	4.1549 *** (0.1219)	5.7816 *** (0.2865)	12.6668 *** (0.6787)	4.1376 *** (0.1506)	5.6187 *** (0.3553)
Observations	3216	3216	3216	1268	1268
R-squared	0.0432	0.0672	0.0380	0.0798	0.0950

Note: Values reported in parentheses are robust standard errors (SE); *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

In term of overdraft accessibility factor, first two columns show a positive but insignificant association between having overdraft facility and firm TFP. However, when applying the FE model, the impact became significant (6.2%, $p < 0.01$). In columns B1 and B2, TFP of firms that shifted to have overdraft facilities in 2015 were significantly higher compared with firms whose status remained unchanged, (8.5%, $p < 0.01$ and 8.2%, $p < 0.01$, respectively).

4.3. Simple DID Results

As mentioned in the identification strategies, the estimates of the above correlations may lead to the possibility of selection biases, which suggest us to compare the differences in TFP of firms that having financial accessibility (treatment group) and firms without (control group). To do that, two models, including simple DID and PSM-DID, were applied.

First, the results of the simple DID model were discussed. In this estimation, a fixed effect regression was used instead of OLS estimate in order to control for unobserved and time invariant characteristics that may impact the outcome variable [59]. Furthermore, since other covariates may change overtime, it is necessary to add control factors that possibly affect the outcome to get the net effect of treatment on the outcome [59]. In particular, the control indicators included two groups: (i) firm specific variables only (including firm size, firm age, and export), and (ii) full set indicators as described in the previous section.

Table 8 showed the average treatment effect of each financial factor in column C1 and C2. In term of bank loan factors, it can be seen in column C1 that the treated firms were approximately 8.61% ($p < 0.1$) and 8.05% ($p > 0.1$) more productive than firms in the control group. However, the impact of overdraft facility on TFP using simple DID when adding full set variables was not statistically significant. In column C2, the results reveal that there were significant positive impacts of overdraft facility on TFP in both cases: including firm specific variables only and adding the full set of variables (12.32%, $p < 0.05$ and 12.26%, $p < 0.05$, respectively).

Table 8. TFP and financial accessibility, DID method.

	C1	C2
	Bank Loan	Overdraft Facility
	TFP	
Firm specific variables only	0.0861 * (0.0502)	0.1232 ** (0.0513)
Full set variables	0.0805 (0.0503)	0.1226 ** (0.0520)
Total observations	1150	1268
Treated observation	199	184

Note: Values reported in parentheses are robust standard errors (SE); *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

4.4. PSM-DID Results

These above results obtained by simple DID estimation may suffer from the bias arising from self-selection and confounding. Therefore, this limitation will be addressed by using the PSM-DID model in this section.

The first step of this technique was to employ PSM to match the firms in comparison group to those that were similar in the treatment group, and then applying DID to the matched sample [57]. By applying this technique, the observable heterogeneity in the initial conditions can be solved.

As described in the methodology, each firm in the treatment group was matched one to one with its nearest neighbor in the control group. A caliper of 0.01 was applied for matching with replacement based on the propensity score estimated by logit model. Table 9 shows the balancing results between treatment and control groups regarding firm specific independent variables. It can be seen that the

balance was remarkably satisfied after matching. To specify, before matching, the mean differences of firm-specific independent variables between treatment and control groups were significantly different. As shown in Table 9, the large differences between two groups of firm size, firm age, export, and bribe due to the fact that firms access to finance tend to be larger, older, have more export products, and pay more informal fees than in the control group. After conducting this matching, these mean differences were successfully reduced as they were adequately close to zero.

Table 9. Balance checking between treatment and control groups.

Independent Variables	Bank Loan		Overdraft Facility	
	Unmatched	Matched	Unmatched	Matched
MICRO	−4.69 ***	−0.72	−15.59 ***	−0.53
SMALL	4.24 ***	0.50	11.48 ***	0.41
AGE	−1.61 *	−0.36	−4.78 ***	0.37
EXP	1.72 *	0.00	5.24 ***	0.00
BRI	1.78 *	0.43	5.42 ***	0.13

Note: Values reported in parentheses are robust standard errors (SE); *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Based on well-balanced matched samples, the next step is to implement the DID method as done in the previous section. The ATT again can be investigated by taking the differences in outcomes using fixed effects regression. ATT estimators for the outcome variables are shown in Table 10. In general, the results showed that applying PSM-DID retained the original positive impacts of financial accessibility on TFP. The most striking feature is that after matching, the ATTs become significantly higher in all financial impacts, suggesting that firms having access to financial services are more productive than firms without. To be more specific, in term of bank loan factor, TFP of PSM-DID approach when investigated firm specific variables only or full set were 9.2% and 8.8% higher than that of simple DID model (8.6% and 8%). Similarly, the TFP of firms with access to overdraft facility after matching are approximately 15.7% ($p < 0.05$) compared with around 12.3% in DID model. All in all, comparing the estimates of simple DID and PSM-DID gives us strong evidence that financial accessibility is necessary for the growth of firm TFP.

Table 10. TFP and financial accessibility, PSM-DID method.

	D1	D2
	Bank Loan	Overdraft Facility
	TFP	
Firm specific variables only	0.0917 * (0.0530)	0.1576 ** (0.0631)
Full set variables	0.0881 * (0.0531)	0.1573 ** (0.0640)
Total matched observations	1125	1201
Treated observation	174	117

Note: Values reported in parentheses are robust standard errors (SE); *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

5. Discussion

The link between financial accessibility and economic performance has been widely discussed in recent years. Empirical studies have shown that access to finance can foster firm growth as well as the economy in general. However, studies have inadvertently underexplored the impact at the micro level. Some studies concluded a positive relationship between financial growth and firm performance [60–62].

Furthermore, some revealed that the lack of access to credit and high cost of finance had negative influences on firm output [63,64]. Osma et al. [65] showed that financing pressures could threaten firm strategic investment. On the other hand, several papers found weak evidence on the role of access to finance in driving firm performance. For instance, Yazdanfar and Ohman [10] showed that firms depending on bank finance and debt were less profitable than their counterparts without. Efobi et al. [64] examined the impact of financial inclusion on the performance of manufacturing firms in Nigeria and found that financial inclusion increased firm performance only in some specific types. With respect to the association between access to finance and the more specific factor: firm productivity. However, most of the previous evidences supported a positive relation between these two variables. Kinda et al. [58] studied the relationship between investment climate and firm productivity in the Middle East and North Africa and showed that the cost and access to finance lead to firm performance discrepancies. Fernandes [66] and Biesebroeck [67] found a positive link between access to overdraft facilities and firm TFP and a negative association between bank loan accessibility and firm TFP in Bangladesh and in several African countries. Gatti and Love [13] detects a strong positive relationship between access to credit and TFP across a sample of Bulgarian firms. In addition to traditional estimation techniques and correlation analysis, some other studies utilizing the causal methods to study the direct link between financial accessibility and firm productivity. For instance, Butler and Cornaggia [62], by taking advantage of a similar event in the US (there was an exogenous shift in the demand of a product), found out that in areas with relatively strong access to finance, production increased. Krishnan, Nandy, and Puri [18] exploit a natural experiment and analyze how an increase in access to bank financing following interstate bank branching deregulations affects the productivity of firms in the United States. They causally established that greater access to finance leads to higher firm level TFP, particularly for financially-constrained firms.

In the context of Vietnam, several studies have examined the link between the access to finance and firm performance as well as firm productivity. However, most of these studies are based on traditional estimation techniques and correlation analysis, which might lead to selective problems. In addition, they did not consider the counterfactual evidence. For instance, Vo et al. [47] investigated binary logistic regression and proved that capital shortage presented a serious barrier for SME development in Vietnam. They also illustrated that firm profits were affected by external factors including commercial or personal loans and credit lines from financial institutions. Another study by Tran et al. [68], using an extensive firm-level survey, examined whether local financial development promoted the performance of small firms in Vietnam using a growth opportunities equation. Their results suggested that policy makers should improve local financial development to enhance firm performance. Thangavelu and Chongvilaivan [69] applied standard ordinary least squares (OLS) estimation and found that access to external credit boosted firm productivity, particularly with exporting and importing firms. Nguyen and Kaizoji [70] studied the relationship between the investment climate and firm productivity and revealed that a lack of access to financial services was harmful to firm productivity.

There have been few studies using the non-parametric approach to identify the influences of financial factors on firm performance. Nguyen [71] analyzed the impact of credit constraints on innovation at the firm level by using PSM in Vietnam in the period 2005–2013. The results of this study found that credit constraints were one of the key factors motivating a firm's innovation. A study by Pham et al. [72] applied the PSM approach to examine the impact of formal credit on firm performance. The findings showed that formal credit improved performance of SMEs in Vietnam via increasing revenue and profit. However, to date, there has been almost no study that applied the causal methods to investigate the link between financial accessibility and firm productivity.

In this study, we employed two different approaches, including DID and PSM coupled with DID, to examine the causal effects of access to finance on firm productivity. The findings of this paper supported the view that firms' access to finance positively influenced their productivity. To specify, the average TFP significantly increased by approximately 8.6% in the DID model and around 9% in the PSM-DID model when firms had access to bank loan. Meanwhile, firms having overdraft

facility improved TFP by around 12.3% and 15.7% in simple DID and PSM-DID models, respectively. In other words, the results demonstrated that increasing the accessibility to finance of firms could directly enhance productivity. In addition, the impacts of overdraft facility and bank loan on TFP were comparable (about 15.7% compared with approximately 9% in the PSM-DID model, respectively). This finding suggested that firms should have priorities on access to short-term cash flow that approached working capital rather than focusing on access to longer-term credit.

Regarding policy implication and enforcement, there have been still a lot of concerns in the context of Vietnam. The fact is that SMEs in Vietnam are still faced with significant challenges in accessing finance and credit. MPI [24] showed that approximately 30% of SMEs in Vietnam could not access external credit from financial intermediates while the other 30% can, but faced numerous difficulties in obtaining funds. In this study, the figures indicated that there were only 28.2% and 26.3% of total firms having access to bank loans and overdraft facility, respectively, during the research period. This is also a common issue in other developing economies. For example, a report by the ADB [73] showed that access to credit significantly affected firm productivity in the Philippines. Firm productivity in Thailand was also found to be associated with access to finance [74]. Hallward-Driemeier et al. [2] indicated that there were only few firms in China having access to formal finance. It was reported that approximately half of the firms in their sample did not have a bank loan from financial institution and even in the other firms, working capital came from bank loans accounted for only about 20% on average. The World Development Report [75] showed that SMEs obtain only 30% of their financing from external sources. An important concern here is the reason why SMEs have been faced with challenges in obtaining external funds. According to Malhotra et al. [76], SMEs were more credit constrained due to financial sector policy distortions, lack of know-how on the part of banks, information asymmetries, and high risks inherent in lending to SMEs. In the context of Vietnamese SMEs, CIEM [25] revealed that the main causes were firms' lack of profitability, the lack of available collateral for a loan and difficulties in obtaining bank clearance. Therefore, it is suggested that the government should contribute to and enhances firms' access to finance by putting efforts to assist them in generating bankable projects. In addition, from the firms' side, SMEs should focus on their financial performance in order to meet the bank requirements and be able to attain bank credit, which will be beneficial to their productivity and sustainability and, hence, contribute to the overall economic growth in the long term.

Although our findings yield important policy implications and contribute to the financial accessibility and firm productivity analysis literature, there are still some limitations and several issues need further discussion. First, the DID-PSM can still meet problem due to unobserved time if the matched control group responds differently to common macro-economic factors than the treated group. To solve this causality problem, it is important to find instrumental variables for explaining variation in the access to finance of enterprises or use dynamic models estimated by regression discontinuity design. Second, another potential future research area is the application of a triple differences approach to observe multiple groups and multiple time periods. Our study involved a biannually data survey, with observable treatment in the period from 2013 to 2015. The fact is that after 2015, many of the other policies are issued while the environmental factors changed. Therefore, our results can potentially be considered as intermediate impacts and a complete effect analysis will require continued observations of the treatment over the long-term. Third, regarding financial services, the study focused only on the external source of funding while other dimensions of finance, such as cash management and payments services, risk management, and insurance, also matter. Fourth, it would be worthwhile to conduct other surveys with more detail questionnaires to deeply understand the mechanism through which access to finance may affect firm productivity. These issues will be implemented in further stages of this research path.

6. Conclusions

This study investigated the causal effects of access to finance on firm productivity using panel data from 2013 to 2015. The productivity was measured as TFP obtained by production function

estimation using the Levinsohn and Petrin [21] approach. The financial accessibility was represented by two variables covering the extent to which firms might have a bank loan and an overdraft facility from a financial institution. The analyses focused on firms that switch from “having no financial accessibility” in 2013 to “having financial accessibility” in 2015 compared with firms remain having no financial accessibility in the both years. Various identification strategies were adopted. First, the correlation between financial accessibility and firm productivity was investigated using the simple OLS and FE regressions. Next, in order to address the problem of endogeneity due to self-selection bias and unobserved confounding of the effect, DID and PSM-DID were employed to evaluate the causal inference of access to finance on TFP. To date, this study is the first to investigate the importance of access to credit for firm productivity in Vietnam using causal methods.

The study found that firms which use financial products improve their productivity compared to nonusers. To be more specific, the average TFP significantly increased by approximately 8.6% in the DID model and around 9% in the PSM-DID model when firms had access to bank loan. Meanwhile, firms having overdraft facility improved TFP by around 12.3% and 15.7% in simple DID and PSM-DID models, respectively. In terms of policy evaluation, these findings seemed to justify the public support to credit supply given the positive properties that access to finance significantly impacted on firm productivity. In other words, it is suggested that government should improve laws and policies that suitable for Vietnamese firm characteristics to help them more easily to access financial facilities. Furthermore, high efforts of policy markers are needed to create a sound and healthy financial environment to stimulate firms accessing to finance.

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