

**MINISTRY OF EDUCATION AND TRAINING
NATIONAL ECONOMICS UNIVERSITY**

PHAM THU VAN

**IMPACTS OF CREDIT ACCESS
AND INNOVATION ON FIRM
PERFORMANCE IN VIETNAM**

**PHD DISSERTATION
IN ECONOMICS**

HANOI - 2024

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PHD DISSERTATION

Supervisor: Dr. VU TUAN ANH

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DECLARATION

I have read and comprehended the University's policy on plagiarism and academic integrity violations. With my own honor, I certify that this research was carried out by me and that it does not violate regulations of good academic practice.

PhD candidate

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LIST OF ABBREVIATIONS

Abbreviations	Full form
SMEs	Small and Medium Enterprises
PCI	Provincial Competitiveness Index
VCCI	The Vietnam Chamber of Commerce and Industry
WB	World Bank
CIEM	The Central Institute for Economic Management
DANIDA	Danish International Development Agency
USAID	The United States Agency for International Development
VND	Vietnam Dong
USD	US Dollar
ATC	Access to credit
NATC	Non-access to credit
GDP	Gross Domestic Production

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CHAPTER 1: INTRODUCTION

1.1. Reasons for choosing the topic

It is firmly believed that credit is a crucial issue of operating and running enterprises. Manaresi and Pierri (2019) analyze data from Italian corporations over more than a decade to estimate the impact of idiosyncratic changes in credit supply on firms' total factor productivity growth. They find that improved access to credit significantly boosts IT adoption, innovation, exporting, and the implementation of superior management practices, which in turn positively affect the total factor productivity growth of firms. “Without adequate access to financing, the staying power of the business and its potential for growth is jeopardised” (Rahaman 2011, p.709). Akoten et al. (2006, p.941) affirm that “better access to credit improves firm performance”. Hence, credit and expanding credit access are among key factors of firm’s growth and development (Phan and Archer, 2020). It is essential for firms to have access to external credit as their self-funding or internal capital is often insufficient for their business operations (Khandker, Samad and Ali, 2013). Particularly for SMEs, they have a high demand for access to external financing to run their business, create new products, enhance employees’ knowledge and skills, and equip more production facilities (Atieno, 2009). Nevertheless, it has never been straightforward for SMEs to obtain credit and other banking services at affordable rates (Rahaman, 2011). This group of enterprises appear to be more credit rationed than do larger firms (Nguyen, Su and Sharma, 2019; Tran and Santarelli, 2013).

Our study is motivated by the Theory of the growth of the firm and Resource – based theory that mainly focus on the connection between scarce resource and the growth of the firm. Following Grant (1991), we divide a firm's resources into two main types: tangible resources and intangible resources. Accordingly, tangible resources are financial resources; Tangible assets are technological innovation, including new products, improvements of technologies or processes, new technologies and processes.

Previous studies highlight that credit is a key factor for growth and development of small and medium-sized enterprises (Akoten et al., 2006; Phan and Archer, 2020; Rand et al., 2009). These enterprises form a large part of the private sector in most countries, particularly in developing ones like Vietnam. In Asian countries, SMEs take

up to 90 percent of all enterprises and create 50 to 80 percent of all jobs. In Vietnam, SMEs account for 95 percent of total enterprises nationwide, create about 77 percent of total employment, and contribute up to 48 percent of GDP (VCCI, 2013). Regardless of their significance in the economy, SMEs appear to face multiple risks such as loss of major suppliers, failure of a partnership, competitiveness from other enterprises, etc. Among the obstacles that SMEs have confronted, the shortage of and difficulty in access to capital are likely to be the most serious problems, followed by the competitiveness, the restriction on the demands for products, the difficulties in land access and business premises (Clusel et al., 2013). A study by Nguyen, Su and Sharma (2019) affirms that SMEs often encounter more financial obstacles than do their large counterparts – such as inadequate collateral, high interest rate, or complex process of credit application. SMEs are considered the weakest and the most vulnerable group once the economy is fluctuated as their operations mainly rely on the borrowing funds (Clusel et al., 2013). SMEs seek credit from formal and informal financial sources. The former arises from institutional venture capital financing, initial public offering, loans from commercial banks and other formal financial institutions, etc. The latter includes borrowing from friends, family members, relatives, private moneylenders, and trade creditors.. According to Pecking Order theory (Myers, 1984) and the M-M theory (Modigliani & Miller, 1958), firms prefer using financing from internal sources due to the adverse selection problem. With regard to external financing sources, the prioritise using debt over equity to utilise the cheaper cost of capital and the tax shield's benefit. Apparently, firms remain their preferences for using internal financing, such as retained earnings, then debt, and equity. This type of financing offers SMEs the simpler process of access to credit, non-bureaucracy, low transaction costs and lending interest rates, and high flexibility of repayment conditions (Cao, 2014). Therefore, this dissertation focuses on the impacts of debt finance to firms.

Along with credit, innovation has played a crucial role for firms to develop and survive in the context of increasing globalisation and global value chains, particularly for small and medium enterprises in developing countries (e.g., Archer, Sharma, and Su, 2020). Firms of all industries in general and those in manufacturing industries in particular have been aware of the needs of engaging in innovation activities to increase their competitiveness, survival and success in the markets (Saunila, 2020). Literature has widely discussed the strengths and weaknesses of SMEs when engaging in

innovation (e.g., Archer, Sharma, and Su, 2020; Love and Roper, 2015). Given the advantages, smaller firms tend to have rapid decision-making, be more willing to take risks when adopting new technology and/or production processes, and be more flexible in response to new market opportunities (Love and Roper, 2015). However, small firms experience disadvantages due to the economies of scale shown through a lower level of cost savings as per the number of goods manufactured, less production efficiency, and lack of specialist resources. Thus, innovation is a key driver for small businesses to enhance their productivity and firm performances. A recent definition of innovation has been given as “a process, namely an activity of creating a new product or service, new technology, new organization, or enhancement of existing product or service using existing technologic processes and organizations” (Ramadani and Gërguri, 2011, p.102). Engaging in innovation activities will improve small firms’ competitiveness with their larger and more resource possessing competitors as well as their long-term success in the markets (Ramadani et al., 2019; Saunila, 2020).

Our analysis builds on a large literature examining the impacts of innovation and innovation–firm performance relationships, in which findings are varied (for a review, see Saunila, 2020). On one hand, previous studies have found the positive association between innovation and firm performance, suggesting that innovative firms perform better than their non-innovative counterparts. For example, Lee, Lee and Garrett (2019) find the positive effect of new product and firm performance with launching marketing innovation for high-tech businesses as well as the positive relationship between process innovation and firm performance with introducing organisational innovation for low-tech companies. In the same vein, Hanelt et al. (2021) show that digital innovation improves firm performance. On the other hand, earlier studies have also shown the negative effects or no statistically significant influence of innovation on firm performance. For example, Koellinger (2008) shows that innovative activity is not necessarily associated with a higher level of firm’s profitability. Artz et al. (2010) find that firm’s patents have a negative impact on both return on assets and sales growth. Similarly, Canh et al. (2019) emphasise that process and product innovations have no benefits to return on total assets. These studies argue that innovation is a risky and expensive activity, resulting in more disadvantages for firms during their operations, such as making firms more exposed to market risk, experiencing higher costs and employee dissatisfaction as well as unwarranted changes (e.g., Simpson, Siguaw, and

Enz, 2006).

Previous empirical evidence has established a link between credit access and firm performance. In the context of Vietnam, Giang et al. (2019) examined the causal effect of access to finance on the total factor productivity of Vietnamese SMEs and found that the ability of firms to secure formal credit from financial institutions significantly increases their total factor productivity. Similarly, Tran and Santarelli (2013) used business operating profit and growth of sales to represent the business performance of Vietnamese SMEs, highlighting the need to research the relationship between credit access and firm performance.

In addition to credit access, the relationship between innovation and firm performance has also shown varied results in existing studies, necessitating further research to clarify this relationship, particularly within SMEs. According to Grant (1991), access to credit and innovation are two critical resources for a company. Therefore, it is essential to investigate the combined effects of these variables on firm performance, especially in the context of Vietnamese SMEs. This research aims to fill these gaps by exploring how access to credit and innovation together influence the performance of SMEs in Vietnam.

1.2. Research objectives and questions

The objective of this study is to examine the impact of credit access and innovation on firm performance as two separated variables. We raise the question whether or not innovative firms perform better than their non-innovative counterparts. We aim to examine the probability of firms to engage in innovation activities in the context of Vietnam and to analyse the impact of innovation on firm's revenue and value added. We also investigate the synergic impacts of both credit access and innovation on firm performance of Vietnamese SMEs.

In details, this study aims to investigate these following objectives:

- analyse the effect of access to credit on firm performance in the case of Vietnamese SMEs
- analyse the impact of innovation on firm performance of Vietnamese SMEs.
- examine the synergic impacts of both access to credit and innovation on firm performance.

The quantitative analysis is carried out in order to answer these following research questions:

RQ1: Whether access to credit affects firm performance, especially in the context of a developing country like Vietnam where equity finance is limited?

RQ2: Whether innovative firms perform better than their non-innovative counterparts?

RQ3: Whether the combination of having access to credit and engaging in innovation leads to a greater improvement in firm performance?

1.3. Subject and scope of the research

Research subjects

The subject of the research is to determine the relationship between access to credit, innovation and firm performance in Vietnamese SMEs which have to face multiple risks including lack of credit, competitiveness from other enterprises, the difficulties in applying technology.

Research scope

The data used in the research is from two surveys including the Vietnam SME Survey and the Provincial Competitiveness Index. The first survey was biennially carried out from 2007 to 2015 in ten cities and provinces across Vietnam (Ha Noi, Phu Tho, Ha Tay, Hai Phong, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Hochiminh City, and Long An). This was the research collaboration among the Central Institute for Economic Management (CIEM, Vietnam), the Institute of Labour Science and Social Affairs (ILSSA) (MOLISA, Vietnam), and the University of Copenhagen (Denmark), under the sponsorship of the Danish International Development Agency (DANIDA). The second survey is the Provincial Competitive Index (PCI), established in 2005 by the Vietnamese Chamber of Commerce and Industry (VCCI) in collaboration with the U.S., has emerged as a pivotal instrument for evaluating the state of economic governance across Vietnam's 63 provinces from the viewpoint of private sector enterprises. It encompasses a range of vital factors such as entry costs, compliance costs, access to land, informal charges, and governance standards. These standards cover various aspects including proactivity, transparency, labor development, and legal institutions.

The purposes of these jointly research efforts between Vietnam and Denmark were to collect data and provide fresh evidence on the actual dynamics and growth of the private sector in Vietnam during nearly one decade.

Research method

The data collected is tested for endogeneity of two main independent variables:

access to credit and innovation. The IV models for panel data are applied to solve these problems. Collected data were analyzed with statistical software of Stata.

1.4. Original contributions of the research

This research makes two key contributions to literature.

First, this research is among the first to investigate the combined effects of access to credit and innovation on firm performance, measured by labor productivity, revenue, and value added by employing the Theory of the growth of the firm and Resource – based theory. We find that credit access has a positive effect on firm’s labour productivity. We provide evidence on the positive influence of innovation through making improvements of existing products and launching new production processes on firm performance. Interestingly, the findings reveal that while the combination of access to credit and innovation does not have a significant effect on labor productivity, it does lead to a notable increase in both revenue and value added for firms. This sheds light on the relationship between financial access, innovation, and firm performance, highlighting the importance of considering multiple dimensions when analyzing their impact on business outcomes.

Second, this research paper presents a pioneering contribution to the field by utilizing a longitudinal dataset derived from manufacturing SMEs across Vietnam. Leveraging data from a biennial SME survey spanning from 2005 to 2013, alongside an annual PCI survey, this paper, to the best of our knowledge, is the first to make use of every available data to create a long-term panel dataset for analyses. Our research distinguishes itself by employing the full set of available data points. It effectively addresses the endogeneity issue in the data through the application of three instrumental variables: distance, credit history, and the mean of innovation, ensuring accurate and unbiased results. This comprehensive approach allows for a holistic examination of SME dynamics and growth by capturing trends and patterns over an extended period.

1.5. Structure of the dissertation

The remainder of the study is organised into five chapters as follows:

Chapter 2: Literature review on access to credit, innovation and firm performance

Chapter 2 presents an extensive overview of existing literature related to finance access, innovation and firm performance, the main research problem of this dissertation research. This chapter further discusses relevant theories that are often applied to address the research matter from previous studies. Based on this systematic review of extent literature regarding impacts of access to finance, innovation to firm performance, several

research gaps were identified, establishing the objectives of this dissertation research.

Chapter 3: Theoretical framework and hypothesis development

Chapter 3 comprehensively describes the theoretical framework which is developed from the theory of the growth of the firm (Penrose, 1959) and Resource – based theory (Grant, 1991) to investigate the impact of access to credit and innovation to firm performance. The conceptual framework thoroughly included all relevant key terms and concepts and ensured clarity and theoretical validity in addressing the proposed hypotheses of the study.

Chapter 4: Research methods

Chapter 4 provides a comprehensive demonstration of the research design and methodology utilized to examine the research objectives and research questions. It delves into detail regarding samples, sampling methodologies, the development of the survey questionnaire, the process of data collection, and the data analysis approach.

Chapter 5: Results of the research

This chapter provides an in-depth depiction of the research outcomes and interpretation of the research findings. Initially, it explicates the demographic characteristics of survey participants through descriptive statistics. Subsequently, employing statistical methodologies using analysis software (Stata), the analysis of regression outcomes and hypothesis testing results are illustrated to indicate what factors affecting access to credit and innovation of SMEs and how credit and innovation affect firm performance.

Chapter 6: Discussions of the research findings and Implications

This final chapter of the dissertation demonstrates the conclusions drawn from the principal findings, theoretical contributions, and practical implications derived from the research outcomes. Additionally, it underscores the limitations of the current study and offers recommendations for further research in related areas.

CHAPTER 2:

LITERATURE REVIEW ON ACCESS TO CREDIT, INNOVATION AND FIRM PERFORMANCE

2.1. Firm performance

Nowadays, firm performance has emerged as a significant topic and commonly utilized as a dependent variable in strategic management research. Despite the fact that it is a common concept in the academic literature, there is controversy about its definition and measurement. Definitions of this concept will be clearly defined in the following paragraphs.

In the 50s, firm performance was considered as the measurement of organizational effectiveness, which represents the extent to which an organization, as a social system with some limited resources and means, fulfill its objectives without an excessive effort from other objectives. The criteria used for assessing performance are organizational productivity, organizational flexibility, and corporate culture between subgroups and teams of organization (Georgopoulos & Tannenbaum, 1957).

Later in the 60s, organizations began to explore new ways to evaluate their performance. During this time, performance was defined as an organization's ability to exploit its environment for accessing and using the limited resources (Yuchtman & Seashore, 1967). The organization's ability to successfully compete for resources over time—that is, to maintain its negotiating position in a particular situation—is thought to be a measure of its overall effectiveness. Given the diversity of resources, the multiplicity of competitive relationships, and the interchangeability of resource classes, multi-dimensional set of criteria must be used to assess organizational effectiveness rather than a single and predetermined criteria.

Price (1968) defines productivity, conformity, and institutionalization are three factors that create the meaning of organizational effectiveness. Moh (1972) notes the productivity, flexibility, and adaptability of the organization as the criteria for evaluating performance. Harrison (1974) considers organizational performance as the outcome of evaluating efforts of organization staff and leaders. Lupton (1977) used productivity, motivation and satisfaction as the measurements of performance. According to Lupton, the productivity rate and levels of motivation and satisfaction of its members should be

high in a well-performed firm. He did not mention to the rate of turnover, costs or labor unrest when measuring the effectiveness of the firm.

Nonetheless, Katz and Kahn (1978) asserted that an organization's efficacy and efficiency were comparable and both essential elements of the overall organizational performance, which may be evaluated by maximizing total returns.

Robbins (1987) defined performance as the degree to which an organization, as a social system, could consider as the applying of organizational theory. Performance was defined by Cherrington (1989) as an organization's definition of success or effectiveness as well as an indicator of how well the organization is functioning to meet its objectives.

In the next ten years, Adam (1994) believed that employee performance had a significant impact on organizational performance. He defined that regular exposure of the company's employees to new knowledge and skills was necessary to ensure high-quality organizational performance. This would help them keep up with market developments and ultimately improve the quality of organizational performance. Cohen (1994) draw a distinction between efficiency and performance based on the outcomes an entity achieves in relation to the resources it uses. Harrison and Freeman (1999) established that a high-performing company that meets stakeholder demands is effective and maintains a high organizational performance.

The definition of organizational performance primarily concentrated on an organization's capacity to effectively utilize its resources in order to accomplish goals that align with the company's established objectives (Peterson, Gijbers, & Wilks, 2003). Verboncu and Zalman (2005) found that performance represents a distinct outcome obtained in management, economics, and marketing that increases the level of competitiveness, efficiency, and effectiveness to the structural organization and its procedure.

The definitions were offered by Lebans and Euske (2006) to help explain the idea of organizational performance:

- Performance is a set of financial and non-financial indicators that provide information on the level of accomplishment of objectives and results.
- Performance is dynamic and it requires judgment and interpretation.

- Performance may be illustrated by using a causal model that describes how future results of firms can be affected by current actions and choices.
- Performance may be understood differently depending on the person involved in the assessment of the firm performance.
- It is necessary to know its fundamentals characteristics to each area of responsibility to define the concept of performance.
- It is necessary to be able to evaluate the results to report a firm's performance level.

Siminica (2008) appreciates that firm performance means efficient and effective firm. Therefore, the performance is a function of two variables, efficiency and efficacy. Colase (2009) considers firm performance covers various and different notions such as growth, profitability, return, productivity, efficiency, and competitiveness. Bartoli and Blatrix (2015) believed that the definition of performance should be achieved through items such as piloting, evaluation, efficiency, effectiveness, and quality.

Measuring firm performance is crucial for assessing the effectiveness of management strategies, evaluating competitiveness, and informing decision-making processes. This literature review synthesizes previous studies to identify key dimensions and methodologies used in measuring firm performance. We will discuss some measurements of firm performance as below:

Financial Performance Metrics:

Financial performance metrics are among the most commonly used indicators to evaluate firm performance. These metrics include profitability ratios (e.g., return on assets, return on equity, profit margins), liquidity ratios (e.g., current ratio, quick ratio), leverage ratios (e.g., debt-to-equity ratio, interest coverage ratio), and efficiency ratios (e.g., inventory turnover, asset turnover) (Kumar & Shaikh, 2019). Financial indicators provide insights into the firm's ability to generate profits, manage its resources efficiently, and meet its financial obligations.

Allgood and Farrell (2014) use turnover to analyze the effect of CEO tenure on firm performance. They discover a dependency on CEO tenure for this relationship. The findings indicate a consistent negative correlation between firm performance and turnover throughout the tenure of internally promoted CEOs. Interestingly, founders

exhibit early entrenchment but are increasingly scrutinized for firm performance as their careers progress, while externally hired CEOs undergo a probationary phase followed by apparent entrenchment during intermediate years, which diminishes over time.

Market-Based Metrics:

Market-based metrics focus on assessing firm performance relative to market dynamics and investor perceptions. Key indicators include stock price performance, market share, and brand recognition (Chen & Zhu, 2019). Market-based metrics provide insights into the firm's competitive position, customer loyalty, and investors' trust on organization. However, market-based indicators may be influenced by external factors such as economic conditions and investor sentiment, which may not always reflect underlying operational performance.

Researchers generally uses market-based measurements such as Tobin's Q and market returns (Combs et al., 2015). Combs et al., 2015 apply Jensen's alpha, the Sharpe ratio, and the Treynor index which are all measures of stock return as organizational performance measurements. In the same vein, Rowe and Morrow (1999) uses Sharpe, Treynor, Jensen's alpha or unsystematic risk extracted from stock market to measure firm performance.

Advocates of market-based performance measures highlight their advantages over accounting measures to justify their use. For instance, Lubatkin and Shrieves (1986) state that market-based performance measurements encompass all pertinent information, unlike accounting measures which cover a singular aspect of firm performance. Some scholars explicitly adopt the shareholder perspective, suggesting that maximizing shareholder income served as an effective tool for fulfilling the firm's economic objectives (e.g., Johnson et al., 1985). Moreover, accounting measurements have faced criticism for being susceptible to managerial manipulation and distortions. It could easily be distorted by depreciation policies, inventory valuation methods, treatment of specific revenue and expenditure items, variations in methods of consolidating accounts, and instances of dishonesty and fraud (Chakravarthy, 1986).

Non-Financial Performance Measures:

In addition to financial and market-based metrics, non-financial performance measures are gaining prominence in evaluating firm performance. These measures encompass various dimensions such as customer satisfaction, employee engagement,

innovation capabilities, and sustainability practices (Ittner & Larcker, 2003). Non-financial indicators provide a holistic view of the firm's performance, capturing aspects beyond financial outcomes that are critical for long-term success and stakeholder value creation.

Chow, C. W., & Van Der Stede, W. A. (2006) use three indicators on nonfinancial measures, including internal operating measures, employee-oriented measures, and customer-oriented measures to examine the extent to which firms combine financial, quantitative non-financial, and subjective performance measures. Based on survey data collected from managers representing 128 manufacturing firms, this research discovers that three types of measures play different roles in supporting a firm's operations. They also find that the measure types have different impacts on employee actions, such as risk taking, efforts at innovation, relative emphases on the short vs. long term.

Abdel-Maksoud, A. et al., (2005) revealed five categories of non-financial performance measures: product quality, customer satisfaction, on-time delivery, employee morale, efficiency and utilization to measure the non-financial performance of manufacturing companies in British factories at the beginning of the 21st century.

Balanced Scorecard Approach:

The balanced scorecard approach integrates multiple performance metrics across financial, customer, internal business processes, and learning and growth perspectives (Kaplan & Norton, 1996). By considering both financial and non-financial indicators, the balanced scorecard provides a comprehensive framework for evaluating firm performance and aligning strategic objectives with operational activities. This approach enables managers to assess performance across multiple dimensions and identify areas for improvement. Bhagwat, R., & Sharma, M. K. (2007) introduces a balanced scorecard framework built specifically for supply chain management, enabling the assessment of day-to-day business operations across four key perspectives: financial, customer, internal business processes, and learning and growth. By using an extensive literature review on supply chain management performance metrics and supported by three case studies involving SMEs in India, the balanced scorecard provides managers with a comprehensive framework for evaluating supply chain management performance, offering a balanced approach to assessing supply chains from multiple business angles. Rosemann, M., & Wiese, J. (1999) apply the same framework – the balanced scorecard

to evaluate the performance of Enterprise Resource planning (ERP) software, including the implementation and the use of this comprehensive software.

In conclusion, measuring firm performance requires a multi-dimensional approach that considers financial, market-based, and non-financial indicators.

In this study, we use labor productivity, revenue and value added as measurements of firm performance due to the availability of the dataset.

2.2. Factors affecting firm performance.

We category the factors affecting firm performance into 3 set of characteristics of firms, characteristics of owner and business environment. In terms of characteristics of firm, we analyse firm age, assets/liabilities, registration, investment, firm size and outsourcing. Regarding characteristics of owner, we consider whether the owner is Communist party member or not, owner's age, gender, education level and network size of owner. Business environment is measured by location (urban or not) and PCI ranking.

(i) Characteristics of firm:

Firm size

In the literature related to access to bank credit and financial performance, firm size emerges as a crucial variable. Numerous studies have highlighted the financial constraints faced by small and medium enterprises compared to larger firms. Calomiris & Hubbard (1990), for instance, observe that smaller companies encounter more significant credit restrictions. Various reasons have been cited in prior research for the limited access of small firms to bank credit, impacting their financial performance. Firstly, small firms often struggle with information omitted, lacking the ability to obtain comprehensive financial data (Binks & Ennew, 1996). Given that many small businesses are owned and operated by entrepreneurs, there may be no legal mandate to regularly disclose financial information, leading to a lack of audited financial statements. Additionally, smaller firms possess fewer assets available as collateral. To mitigate the perceived risks and moral hazards associated with lending, banks frequently require collateral, which serves as a safeguard in the event of default and reinforces the borrower's commitment to loan repayments. Berger and Udell (1995) found that smaller and younger firms are more likely to face higher financing costs and are often required to pledge collateral assets.

Firm age

The age of an enterprise affects the financial performance of the business. Many researchers suggest that their operational efficiency tends to decline as businesses operate longer. For example, Sorensen and Stuart (2000) argue that the age of an enterprise impacts its operations. They further contend that the inertia of long-established firms tends to make them inflexible and unable to accurately assess environmental changes. However, long-operating businesses can also become outdated and cause business decline (Agarwal & Gort, 2002). If performance gradually diminishes as businesses age, this may explain why most of these businesses eventually undergo succession (Loderer, Neusser, and Waelchli, 2011). On the other hand, several studies indicate that long-operating businesses have high operational performance. Liargovas and Skandalis (2008) report that mature businesses possess higher skills because they benefit from learning advantages and are less susceptible to the liabilities of newness, resulting in superior performance. Loderer et al. (2009) find a positive and significant relationship between a business's operating time and profitability.

Registration

Registration offers firms access to risk pooling mechanisms, attracting more educated, better-paid workers, and fostering longer-term relationships, thus rendering investments in training and capital goods more profitable. Moreover, formality may serve as a prerequisite for accessing formal credit markets or government-provided business development services. Productive firms are more inclined to expand, necessitating formality. However, a significant portion of the association between formality and productivity may stem from underlying firm characteristics rather than formality itself. Similarly, successful businesses are more likely to come under government scrutiny as they grow, potentially prompting them to formalize operations to evade fines and/or bribes. Fajnzylber et al. (2011) employ data from the Brazilian Survey of the Urban Informal Sector (ECINF) collected in 1997 and 2003 to demonstrate that Brazil's SIMPLES program significantly increases registration rates among businesses, resulting in substantially higher revenues, employment, and profits for registered firms.

Investment

Farazzi et al. (1988) study the effects of cash flow on firm investment in the case of entrepreneurship and small business economics. They show that inadequate financial resources become an obstacle, directly lead to the failure of business, given that firms with greater financial resources can invest in more innovation and have a large financial potential to handle any market shocks than firm which is lack of financial resources. This result is confirmed by Tran and Santarelli (2013) when they investigate the panel data of 1721 SMEs in Vietnam in 4 years.

Outsourcing

In recent years, the practice of outsourcing has gained considerable momentum, driven by the recognition that no firm operates as a single entity. Companies now routinely delegate various functions such as manufacturing, IT, accounting, human resources, and research and development (R&D) to external partners, both domestically and internationally. However, there has been a growing interest in the concept of reshoring, spurred by arguments from scholars and practitioners suggesting that the risks associated with outsourcing may outweigh its benefits. While some studies have suggested a positive correlation between outsourcing and firm performance, Barthelemy and Adsit (2003) caution that these claims, often observed during the initial stages of outsourcing, may not accurately reflect the long-term relationship. Unfortunately, longitudinal studies examining the impact of outsourcing on firm performance over extended periods are scarce. Awe, Kulangara, and Henderson (2018) seek to address this gap by conducting a meta-analysis of 51 empirical findings from 24 articles, investigating the relationship between outsourcing and firm performance. Their analysis reveals that outsourcing indeed contributes to improve firm performance. Notably, when examining specific functions outsourced, IT outsourcing emerged as the most impactful, possibly due to its relatively lower implementation costs compared to other forms of outsourcing.

R&D/Innovation

The fields of entrepreneurship and innovation share numerous connections, leading to a plethora of studies in entrepreneurship literature centering on firms' innovative endeavors. Measuring innovation poses challenges primarily because studies are constrained to examining inputs like research and development (R&D), staff, or

financial resources, intermediate outputs such as patents, and ultimate outcomes like sales of new products (Hopkins and Siepel 2013).

Capital resources

Capital resources encompass productive assets like equipment, inventory, and plant, which are man-made and utilized in generating income. Financial resources play a crucial role in ensuring the profitability of business operations. Small and Medium Enterprises (SMEs) face challenges due to their limited resources, making it difficult to access funding sources, relying heavily on single products, having inadequate budget control systems, and lacking economies of scale (Thurik, 2007). Recent research on SMEs in Indonesia indicates that they often adhere to traditional marketing approaches. In response to competitive pressures, SMEs should proactively engage in business development and research (Robert, 2007).

Technology

Technology also holds considerable role over the financial performance of small and medium enterprises (SMEs), given its pivotal role in enhancing production processes. Various studies have underscored the importance of adopting new technology and equipment for SME development (Swierczek & Ha, 2007). Enterprises employing cutting-edge technology often outshine competitors in capturing customer attention, despite the initial costs associated with technology adoption. While technology investments entail expenses, businesses typically compensate these costs over time while gaining a competitive edge. However, in many third-world countries, SMEs face challenges in adopting new technology due to its prohibitive costs. Nonetheless, prior research has consistently linked technology adoption with SME success, highlighting a positive correlation between technology utilization and business outcomes (Cartsson, 2008). In the most recent study, financial flexibility emerged as significantly correlated with business success and financial performance. SMEs leveraging external capital sources, such as banks and financial institutions, tend to enjoy better prospects for financial performance and success (Pitman, 2008).

(ii) Characteristics of owner:

Owner's age

Coleman (2002) suggests that older owners tend to exhibit greater risk aversion,

leading to reduced willingness to seek external financing. This notion is supported by Cucculelli and Micucci (2008), Parker and van Praag (2006), and Miller (1991), who observed a negative correlation between age and the founder's contribution to company performance. Age is a significant predictor of entrepreneurial behaviors within family firms, with CEOs often preoccupied with succession planning as they age (Feltham et al., 2005). As succession approaches, aging CEOs may prioritize a smooth transition to avoid jeopardizing family wealth over pursuing risky entrepreneurial ventures. In Vietnam's transitional economy, characterized by business dynamics, the relationship between age and performance is particularly sensitive to aging, with constantly evolving rules shaping this dynamic interplay.

Gender

Regarding owner characteristics, businesses led by women exhibit a greater opportunity to seek loans. Yaldiz, Altunbas, and Bazzana (2011) note that female entrepreneurs often demonstrate increased demand and improved access to formal credit due to their enhanced education and business sensation. Similarly, Barslund and Tarp (2008) and Chaudhuri and Cherical (2012) highlight the likelihood of women, compared to men, to access credit opportunities which leads to higher performance of firm.

Owner's education level

It is widely believed that well-structured business activities, as outlined in a comprehensive business plan, contribute to improved financial performance. A study conducted in Indonesia reveals a positive relationship between entrepreneur literacy levels and the success and financial performance of SMEs, emphasizing the significance of planning, organizing, and directing efforts (Huggins, 2007). These variables hold crucial importance for SME success, as evidenced by numerous prior studies highlighting their deep connection with SME performance. According to King and McGrath (2002), individuals with higher levels of education and training tend to achieve greater success in the SME sector. Literacy levels are reflected in their ability to execute managerial tasks, including financial decision-making and investment management, which in turn influences decisions regarding external funding such as bank credit and subsequently impacts enterprise financial performance. Limited literacy levels often hinder SME traders from discerning the various loan products offered by financial institutions, as many of these services are presented in complex banking terminology,

discouraging traders from seeking loans. Additionally, deficiencies in financial management skills and strategic planning place SMEs at a disadvantage compared to larger firms led by well-educated professional managers, thus diminishing SME financial performance levels.

Party member

Su, Z. Q., & Fung, H. G. (2013) employ panel data analysis to investigate the correlation between political ties and firm performance among Chinese companies spanning the years 2004 to 2008. They find evidence supporting a positive association between political affiliations and firm performance. Political connections mitigate the adverse impact of related-party transactions on firm value. Additionally, they investigate the mechanisms through which the advantages of political ties manifest, including increased cash reserves, larger long-term loans, reduced financing expenses, enhanced sales figures, and lower sales costs. Their results suggest that both state-owned enterprises and non-state-owned enterprises leverage political connections equally effectively to boost performance.

Network size

Networking, encompassing both official and social networks, plays a crucial role in enhancing SMEs' access to various sources of capital, including banks. Scholars such as Le & Nguyen (2009) and Malesky & Taussig (2009) define the significance of networking, especially in the context of firms operating in developing countries. Shane & Cable (2002) highlight the use of networks in mitigating information asymmetry in creditor/debtor relationships. Overall, networking and relationships serve as substitutes for deficient market institutions, facilitating firms' access to external credit, including bank loans. Moreover, networks enhance a firm's legitimacy, thereby positively influencing its firm performance, as affirmed by Safavian & Wimpey (2007) and Straub (2005). Le et al. (2006) suggested that networking, especially with government officials, is more effective for accessing credit in the initial stages of firm development, thus improving firm efficiency. Additionally, social networks, particularly those within social organizations, significantly enhance access to informal credit sources and then enhance their performance.

(iii) Business environment

Credit access

The relationship between credit access and firm performance is a well-studied topic in economic theory. Several theoretical frameworks explain how access to credit significantly impact the performance of firms. Financial Constraints Theory posits that firms with limited access to external financing face significant barriers to growth and performance. Financial constraints limit a firm's ability to invest in profitable projects, adopt new technologies, and expand operations. Consequently, firms with better access to credit can finance these activities more effectively, leading to higher performance levels. Investment Theory suggests that the availability of credit influences a firm's investment decisions. When firms have access to sufficient credit, they can undertake more investment projects, especially those with high expected returns. Access to credit allows firms to smooth out investment over time, avoiding the need to rely on internal funds. From the Resource-Based View of the firm, access to credit can be considered a critical resource that enhances a firm's capabilities. With adequate financing, firms can acquire and develop other valuable resources such as advanced technology, skilled labor, and efficient production processes. These resources, in turn, contribute to improved competitive advantage and better overall performance. Empirical evidence on the relationship between credit access and firm performance is also discussed in the research of Motta (2020), Buyinza and Bbaale (2013), Kinda et al. (2011), Kira and He (2012).

Location

Beck (2007) highlighted the considerable disparity in firms' financing challenges across countries after adjusting for differences in GDP per capita. This suggests that geographical factors, particularly firms' locations, likely play a role in credit constraints and consequently influence firms' access to credit. Yaldiz (2011) empirically demonstrated that businesses located in smaller cities tend to rely more heavily on informal credit sources compared to those in larger cities. Similarly, Gine (2011) found that the transaction costs associated with assessing a firm's credit worthiness are typically higher in rural areas, leading banks to exhibit reluctance in extending loans to firms located in rural or remote regions. Conversely, enterprises situated in urban areas or in close proximity to commercial banks may find it easier to secure bank loans due

to the convenience it offers banks in monitoring and gathering "soft" information essential for loan decisions.

PCI ranking

The Provincial Competitive Index (PCI), established in 2005 by the Vietnamese Chamber of Commerce and Industry (VCCI) in collaboration with the U.S., has emerged as a pivotal instrument for evaluating the state of economic governance across Vietnam's 63 provinces from the viewpoint of private sector enterprises. It encompasses a range of vital factors such as entry costs, compliance costs, access to land, informal charges, and governance standards. These standards cover various aspects including proactivity, transparency, labor development, and legal institutions. The PCI serves as a comprehensive benchmark for assessing the performance and competitiveness of different provinces in Vietnam's economic landscape. It has been applying in various research (Cao., 2014, Le., 2012)

2.3. Impacts of access to credit to firm performance

In recent years, there has been increasing concern regarding the challenge of accessing mainstream credit or finding credit that aligns with the specific needs of firms, particularly those with small and medium sizes and limited financial literacy. This issue is prevalent in most financially developed countries.

The concept of access to finance can be defined as “availability of a supply of reasonable quality financial services at reasonable costs, where reasonable quality and reasonable cost have to be defined relative to some objective standard, with costs reflecting all pecuniary and non-pecuniary costs” (Claessens, 2006). It can also be defined as the “absence of price and non-price barriers” (Demirguc-Kunt and Bek, 2008). Access to finance can be considered as fundamental capital of every firm. While the effect of access to finance on firm’s performance becomes an interesting topic around the whole world, availability of finance becomes challenging issue for SMEs (Fowowe, 2017).

Access to finance can be defined as an absence of both price and non-price barriers to the use of financial services (World Bank, 2011). Especially, access refers to the supply of services, whereas use is influenced by both demand and supply (Ganbold, 2008). SMEs, however, face significant challenges in obtaining external financial

resources, both from formal or informal institutions (Mason & Kwok, 2010; Hughes, 2009; Guijarro, Garcia, & Auken, 2009).

Numerous studies have shown that sufficient access to financial resources provides many benefits to businesses, especially SMEs. Access to finance is a key driver of an efficient economic environment (Isern et al., 2009; Eriksson et al., 2009; Hussain et al., 2006). The World Bank and the International Finance Corporation (IFC) rank economies based on the ease of doing business, with access to credit being a crucial criterion (World Bank, 2011). The Global Entrepreneurship Monitor (GEM) identifies entrepreneurial finance, or the availability of financial resources for SMEs in the form of debt and equity, as a critical factor in stimulating and supporting entrepreneurial activity (GEM Global Report, 2010).

The World Bank's Investment Climate Surveys indicate that access to finance enhances firm performance by facilitating market entry, company growth, and risk reduction (Beck, Thorsten, Demirguc-Kunt, & Asli, 2008). It also promotes innovation and entrepreneurial activity (Klapper, Laeven, & Rajan, 2006). Moreover, firms with better access to capital can better exploit growth and investment opportunities (Beck, Thorsten, Demirguc-Kunt, & Maksimovic, 2006). Therefore, improving access to capital can enhance overall economic performance (World Bank, 2011).

Access to credit refers, on the other hand, specifically to the ability of firms or individuals to borrow money from lenders, such as banks, credit unions, or other financial institutions. This borrowing can take the form of loans, credit lines, or credit cards. Credit is typically used for short to medium-term needs, such as working capital, purchasing inventory, or funding immediate business expenses. The borrowed funds must be repaid with interest over a specified period. SMEs in Vietnam face limited availability of other financial sources. Many SMEs have limited access to equity financing due to underdeveloped capital markets and stringent requirements for issuing equity. Although venture capital is growing, it remains concentrated in specific sectors like technology and innovation. Traditional SMEs in less glamorous sectors find it difficult to attract venture capital. Government grants and subsidies, while available, are often limited in scope and amount. The application process can be bureaucratic and competitive, making it challenging for many SMEs to secure these funds. Therefore, access to credit is especially important to SMEs, since other form of financial sources

are mostly not available for SMEs in Vietnam.

According to Beck et al., (2009), three primary methods for measuring access to credit have been used in many researchs. The first method counts the number of users of basic financial services, the second relies on firms' evaluations of the quality of the financial services they receive, and the third examines the cost of barriers to access. Each method has its limitations: for the first method, the quality and price of finance received by account holders at various financial institutions can vary significantly; for the second, the reliability of subjective service quality assessments may be questionable; and for the third, data on certain barriers (such as the distance to a bank branch or the documentary requirements to open an account) may be easier to collect and thus it could be more completed than data on other barriers. Nonetheless, these data help us understand the measurement of financial access and suggest potential policies to remove barriers and expand access.

Despite the usefulness of these methods, the limitations of the available data are drawbacks of methods: even the number of individuals with a bank account could be hard to collect and measure. Although we may know the number of accounts, many firms have multiple accounts, others have none, and regulatory authorities generally do not collect data on individual account holders. The most accurate data would come from primary survey data, allowing researchers to measure financial access across sub-groups. However, few such surveys exist for firms, and there are issues with cross-country data compatibility. In the absence of comprehensive micro-data, researchers have attempted to create synthetic indicators, combining the results of existing surveys with more readily available macro-data on the number of accounts and financial depth indicators (Honohan 2008a). For instance, the proportion of firms with some access to a bank account can be estimated by a nonlinear function of the number of accounts in commercial banks and microfinance institutions (MFIs) and the average size of these accounts, as validated by available survey data on firms' accounts.

Literature highlights that small and medium enterprises in emerging countries seek financing from internal and/or external financial markets to run their businesses as well as invest in business operations (for example, Archer, 2021; Hoang and Otake, 2014; Trinh et al., 2017). Earlier studies on access to credit of firms pay separate attention to formal credit or informal credit (for example, Buyinza and Bbaale, 2013;

Cao, 2014; Le, 2012; McPherson and Rous, 2010). Due to market imperfection, asymmetric information problems, agency risk and limited collateral availability, small firms appear to be more credit rationed in the formal financial markets than their counterparts (Stiglitz and Weiss, 1981; Wellalage and Locke, 2016). Therefore, they are likely to seek financing from alternative sources that arise from family members, friends, or moneylenders, or rely on equity funds, also known as funding from owners (Hoang and Otake 2014). For example, Beck et al. (2008) explore data of 3,000 enterprises in 48 countries and find that small firms are slightly dependent on formal loans but heavily reliant on internal and informal capital than are larger firms. A study by Cao (2014) shows that in developing countries like Vietnam, mobilising capital from informal sources is the most familiar and favourable choice of SMEs, especially during the start-up stage of business. CIEM (2014) shows that borrowing from informal sources occupied 80 percent of the number of SMEs' loan applications.

Previous studies show that having access to credit has a significant impact on firm performance (for example, Buyinza and Bbaale, 2013; Lan, Mai, and Khiem, 2016; McPherson and Rous, 2010; Rahaman, 2011). A wide range of proxies has been used to capture firm performance. Tran and Santarelli (2013) use annual income and growth of sales as proxies for firm performance. Akoten et al. (2006) measure firm performance by current profitability and employment growth rate and find that credit access is not a crucial factor affecting performance of garment firms in Kenya. Rahaman (2011) uses employment growth and sales growth to represent firm growth and affirms that access to internal funding significantly affects the growth of firms. Shinozaki (2012) indicates a negative impact of low credit access on firm SME survival and growth rates. Khandker, Samad and Ali (2013) find that limited credit access may decrease the profit margin of microenterprises in Bangladesh.

Further empirical evidence on the link between credit access and performance is discussed. In general, better access to credit is associated with the ability of enterprises to finance their business expansion and to allocate resources to their most profitable projects (Motta, 2020), resulting in a higher level of firm performance. For example, Buyinza and Bbaale (2013), in a study conducted for five East African Community countries include Uganda, Kenya, Rwanda, and Burundi, show that credit-access firms have 0.2 to 0.3 percentage-points higher level of business performance than their counterparts. Using a sample of developing countries in Middle East and North Africa

(MENA), Kinda et al. (2011) confirm that satisfactory access to financing is a core factor contributing to the productive performance of an enterprise in Countries in Middle East and North Africa (MENA) include Algeria, Egypt, Morocco, Oman, Lebanon, Saudi Arabia, and Syria. In a study on access to finance by small and medium enterprises in Tanzania, Kira and He (2012) indicate that better credit access supports SMEs in utilising assets to enhance their productivity. As well, Motta (2020) aims to investigate the impact of both lack of access to external finance and project quality on labour productivity of firms in Brazil. By using cross-sectional firm-level data from the World Bank Enterprise Surveys, the author finds that small and medium firms having limited access to external financing (those that applied for bank loans but were denied) have lower levels of labour productivity than those obtaining bank loans.

Bose, Mallick and Tsoukas (2020) employ a rich dataset of Indian firms to examine whether easing access to foreign financing impacts firms' productivity. The authors show that firms with access to foreign financing have better production and innovation networks, which fosters their performance and exporting intensity, resulting in better productivity than those with domestic sources of financing only. In a study on credit constraints and productivity of SMEs in Canada, Cao and Leung (2020) find that financial constraints and the estimated total factor productivity are negatively correlated, suggesting that firms being financially constrained are less productive than their counterparts. Apparently, capital access, particularly medium and long-term financing, is one of the uppermost determinants of firm performance (Bloom et al., 2010).

In the context of emerging Asia, the growth of firm is captured by the total annual sales value (Shinozaki, 2012). It is indicated that credit access, especially to the formal system, has a significantly positive relationship with the profit level of enterprises. Using data from the Vietnamese SMEs survey, Giang et al. (2019) examine the causal effect of access to finance on productivity of total factor productivity of Vietnamese SMEs and find that the ability of firms to secure formal credit from a formal financial institution increases their total factor productivity. In particular, firms having access to credit have a higher level of total factor productivity by approximately 9% than their counterparts. In the same vein, Jin, Zhao and Kumbhakar (2019) analyse the relationship between financial constraints and productivity using firm-level data from Chinese manufacturing industries. The authors find that approximately 90% of firms experience difficulties in having access to financing from external sources. The authors also find

that access to credit, or financial constraints, have a non-monotonic impact on firm productivity. As such, financial constraints enhance productivity for mildly financially constrained firms, and hinder productivity if the constraints exceed a threshold when productivity reaches the maximum level.

In a study on Vietnam, Tran and Santarelli (2013) use business operating profit and growth of sales to represent business performance of Vietnamese SMEs. Interestingly, firms with limited credit access secure a higher level of business earnings and sale growth than their counterparts. The reasons come from the sufficient development of the informal credit market in Vietnam and the low debt share of surveyed enterprises, which implies the little preference of Vietnamese SMEs for external debt. From their perspectives, such the measures mentioned above are highly sensitive to exogenous shocks and thus, offer a rather unstable proxy of performance.

2.4. Impacts of innovation to firm performance

According to the European Commission (1995), innovation is "the successful production, assimilation, and exploitation of novelty in the economic and social spheres." Innovation involves the renewal and expansion of the range of related market products and services; the establishment of new methods of production, supply, and distribution; and the introduction of changes in management, work organization, working conditions, and workforce skills.

According to the standards set by the Organisation for Economic Co-operation and Development (OECD) in the Oslo Manual 2005 (OECD, 2005), "innovation is the implementation of a new or significantly improved product (goods or services), a new marketing method, or a new organizational method in business practices, workplace organization, or external relations."

The definitions in the Oslo Manual 2005 were supplemented and developed from the Oslo Manual 1997. In this context, product innovation and process innovation in the Oslo Manual 2005 are similar to the definitions in the Oslo Manual 1997 and are collectively referred to as technological innovation.

Schumpeter (1939) defined technological innovation as a new method of combining production factors resulting in altered inputs to produce outputs. He viewed technological innovation as a sequential process pivotal to comprehending economic

growth. Jiang (2001) explored the dynamic mechanism of technological innovation activities, identifying six key factors driving enterprise technological innovation: benefit-driven initiatives, market or social demand, employee motivation, corporate image, technological development drive, market competition, and governmental influence. The first four factors are internal drivers fostering technological capability accumulation and innovation, while the latter two are external pressures compelling innovation behavior. Furthermore, through technological innovation, SMEs can upgrade processing equipment, manage resources more efficiently, enhance environmental protection measures, promote clean production, and expedite research and development (Feifei and Li, 2007).

Over recent decades, researchers have increasingly focused on technological innovation, delineating various types based on numerous surveys. According to the Oslo Manual (OECD, 2005), technological innovations are broadly categorized into product and process innovations. Technological product innovation involves the introduction of new or significantly upgraded products, integrating new knowledge or techniques to meet customer needs. This type of innovation requires firms to be technologically adept to serve customers effectively, encouraging them to enhance internal competencies and meet market demands. Technological process innovation, on the other hand, entails the adoption of new or enhanced production or service delivery methods, often leading to cost reduction, quality improvement, or the introduction of new products or services (OECD, 2005). These innovations transform firms' production or service operations, altering manufacturing processes significantly.

In the OECD Oslo Manual (2005), innovation is categorized into four types: product innovation, process innovation, organizational innovation, and marketing innovation.

- Product innovation involves the introduction of a new or significantly improved product with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, integrated software, user-friendliness, or other functional characteristics.

- Process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment, or software.

- Organizational innovation involves the implementation of a new organizational method in a company's business practices, workplace organization, or external relations.
- Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion, or pricing.

The funnel model, developed by the Massachusetts Institute of Technology (MIT) in 2005, and the innovation value chain model, proposed by Hansen and Birkinshaw (2007), may be more effectively applied to enterprises with linear innovation processes rather than complex innovation processes with feedback loops. Typically, a linear process allows businesses to manage innovation using a "gate" system, filtering ideas that are good enough or not to move on to the next stages of the process. This can ensure organizational safety, but it can be time-consuming and is more suitable for incremental innovations rather than breakthrough innovations. The weakness of these models is that they do not take into account external factors that impact a company's innovation capacity, such as institutions, infrastructure, market demand, the level of industry competition, competition policies, intellectual property, and government support policies for innovation.

Innovation refers to the process within a business that assesses how skills and resources are deployed to develop novel products, services, or establish new production systems and operations, aiming to fulfill customer needs (Gao, Hsu, & Li, 2018). It plays a crucial role in creating value, such as accessing new markets, maintaining existing market share, and enhancing competitive advantage. As an integral part of business strategy, innovation enables businesses to thrive in the global marketplace. Both academic and industrial research have increasingly focused on innovation, recognizing its significance in gaining sustainable competitive advantage (Hitt, Ireland, Camp, & Sexton, 2001; Kuratko, Ireland, Covin, & Hoprnsby, 2005).

Literature has widely discussed the importance of firm-level innovation and its impacts on firm performance and growth (Rosenbusch, Brinckmann, and Bausch, 2011; Tuan et al., 2016; Le et al., 2023). Innovation has been considered as a key driver for long-term success of firms and business entrepreneurs (Archer, Sharma, and Su, 2020). Engaging in innovation activities through either launching new products and/or services, improvements of existing products and services, introducing new production processes,

or new business models increases firm's competitiveness and survival in the markets, particularly for smaller-sized firms as they experience disadvantages in doing business as opposed to their larger counterparts, such as the economies of scale and source of specialists (Rosenbusch, Brinckmann, and Bausch, 2011). Despite of business sizes, small firms have widely been seen as successful innovators.

The majority of earlier studies, on one hand, have highlighted the positive relationships between innovation and business performances. Burrus, Graham, and Jones (2018) examine the relationship between regional innovation and firm performance of publicly traded firms in the U.S. The authors argue that an innovative community should increase reinvestment and continued growth for both the firm and the community, resulting in a good firm performance, on a cycle. The study finds that country-level inventive activity is positively connected to revenue and profit growth, while technical creativity positively affects process improvement and net income growth.

Gërguri-Rashiti et al. (2017) study the effects of information communication technologies (ICT) and innovation on firm performance in European countries. The firm-level dataset sourced from the Business Environment Enterprise Performance Survey (BEEPS) is used in the analysis. By using a dynamic approach, the authors find that the change in the usage of ICT and other determinants affecting innovation have increased the probability that firms undertake innovation activities and hence, enhance firm performance. Their findings are confirmed by Chege, Wang, and Suntu (2020) in a study of Kenyan firms, in which the authors analyse the impacts of technology innovation on firm performance, taken into account entrepreneur innovativeness. The authors apply the structural equation modelling method and find that technology innovation positively affects firm performance.

In the same vein, Ramadani et al. (2019) use the Business Environment Enterprise Performance Surveys (BEEPS) to measure the impacts of product-only innovation activities on firm performance in transition economies. By adopting the Crepon-Duguet-Mairesse (CDM) model and a four-stage approach, the authors confirm the positive relationship between product innovation and firm performance in transition economies, complemented by a significant impact of control variables such as size, total labour cost, and firm's financing. In the case of Germany, Hanelt et al. (2021) explore the longitudinal panel dataset of automotive manufacturers and adopt the firm fixed-

effects regression and negative binomial method to examine the impact of digital innovation on firm performance of industrial-age firms. Results show that digital innovation improves firm performance of industrial-age firms.

In the case of China, Zhang, Rong, and Ji (2019) investigate data from listed manufacturing firms in China for the 2000–2010 period to emphasise a positive and significant impact of green patenting on firm performance. The authors highlight that this positive relationship only exists among state-owned enterprises (SOEs) who can utilise their close relationship with the government in adopting green utility-model patents, especially since when the government began to provide formal legislative support to green industry. Lee, Lee and Garrett (2019) examine the effects of innovation on firm performance by using data from the translated version of the Community Innovation Survey (CIS) known as the Korean Innovation Survey (KIS) 2014. By applying principal component analysis and path analysis, the authors find that the innovation has positive effects on firm performances at four types of innovation activities: product, process, marketing and organizational innovation. This relationship varies based on innovativeness levels and industrial categories. Using Vietnamese supporting industries primary data, a study by Tuan et al. (2016) examines the effects of innovation on firm performance of supporting industries. By applying the quantitative methods of reliability, factor analysis and regression analysis, the authors find that organisational innovation is positively related to innovative performance and hence, leading to the increase of firm performance, captured by production performance, market performance, and finance performance.

In the context of Pakistan, Wadho and Chaudhry (2018) use the unique innovation survey data at the firm level in the textile and wearing apparel sectors to frame the connection between innovation and firm performance. The authors apply a multi-stage structural model that links the probability of a firm to innovate, its innovation investment, product innovation, and business performance. Results show that product innovation increases labour productivity as well as higher labour productivity growth. The authors also emphasise that firms having a higher level of investment in innovation are more productive, and those with organisational innovation have a higher level of innovative sales per worker than their peers.

On the other hand, literature has found the negative, non-linear, or no significant

relationship between innovation and firm performance. For example, Latifi, Nikou, and Bouwman (2021) employ cross-industry data of SMEs in Europe and adopt structural equation modelling to provide evidence on the influence of business model innovation on firm performance. The study finds no significant direct connection between business model innovation and firm performance; yet, business model innovation fully affects efficiency growth, organisational capabilities and revenue growth, which in turn these factors contribute to fostering firm performance. Hatzikian (2015) explores primary data from a national survey to test the hypothesis of a U-shaped relationship between innovation and firm performance, particularly in the short-term period. By applying the method of introduction of squared terms as independent variables, the author shows empirical evidence on a U-shaped curve where the innovation intensity decreases in the initial stage, then reaching a critical point at the minimum level of labour productivity, and increasing together with the increase of the innovation expenditure.

Similarly, Zhang et al. (2018) provide the evidence of an inversed U-shape relationship between open innovation and firm profitability, using data from the Chinese mechanical manufacturing industry. The authors suggest that an open innovation strategy might be applied to firms but with caution due to the inverted U-shape relationship between innovation and firm performance. In the context of Vietnam, Canh et al. (2019) conducted a study on the proactive innovation vis-à-vis firm performance relationship using data from the Vietnam's SMEs Surveys. The authors apply pooled Ordinary Least Squares (OLS) with robust standard errors and find that firms undertaking technological innovations have better performances than their counterparts, showing through increases in firm sales and profits. The authors further analyse the impacts of proactive and reactive innovations on business performances. Results show that reactive innovation has a negative impact on firm performance, suggesting that reactive innovation holds back firm performance. The study shows no direct link between proactive innovation and firm performance but a mediation impact: proactive innovation positively affects firm capability to innovate, which ultimately results in a better firm performance.

To summarise, findings on innovation-firm performance relationship remain mixed with the majority of literature being more prone to demonstrate the positivity of this relationship. In this study, we aim to provide fresh evidence on how innovation in general and products innovation, products-improved innovation, and process innovation in particular, affect SME performance in Vietnam.

2.5. Research gaps

During the 2006-2015 period, alternative forms of financial sources such as venture capital, angel investment, and bond markets were rather limited for SMEs in Vietnam. SMEs had restricted access to various forms of financing that are typically available in more developed financial markets. The venture capital and angel investment ecosystems were underdeveloped, and the bond market was not a viable option for most SMEs. This lack of alternative financing made traditional credit from banks and financial institutions a critical source of funds for these businesses. As a result, the impact of access to credit on SMEs' performance in Vietnam is likely to be more pronounced, providing a unique context for analysis. While similar research has been conducted using datasets from other countries, the specific context of Vietnam presents unique challenges and opportunities. By focusing on Vietnam, the research can contribute to the existing body of literature by highlighting the distinct factors influencing SMEs in a developing economy with limited financial infrastructure. This comparative perspective can enhance the understanding of how access to finance affects SME performance in different economic contexts.

The thesis identifies several research gaps that need to be addressed. One significant gap is in understanding the channels through which credit access impacts firm performance. The thesis aims to explore whether the effects stem from formal or informal credit sources, providing a clearer picture of how different types of credit access influence SMEs.

Another research gap pertains to the role of innovation in firm performance. The thesis categorizes innovation into three types: product innovation, process innovation, and technological innovation. Specifically, it investigates whether firms that engage in innovation by introducing new products, improving existing products, changing specifications, or adopting new production processes or technologies, experience enhanced performance. By addressing these gaps, the research seeks to provide a comprehensive analysis of the combined effects of credit access and innovation on the performance of Vietnamese SMEs.

These are significant contributions of this research to bridge the gap of literature regarding the relationship between capital, innovation, which are the two most important resources of firm growth according to *The Theory of the Growth of the firm*, Edith Penrose (1959), and firm performance.

CHAPTER 3:

THE THEORETICAL FRAMEWORK ON THE THEORY OF THE GROWTH OF THE FIRM

3.1. Neoclassical theory of firm growth

3.1.1. The natural of firm by Coase (1937)

Coase (1937) provides an economic rationale for the preference of individuals to establish partnerships, companies, and other business entities rather than engaging in bilateral contracts within a market. It posits that firms emerge because they are more adept at managing transaction costs inherent in production and exchange compared to individuals. Economists such as Oliver Williamson, Douglass North, Oliver Hart, Bengt Holmström, Arman Alchian, and Harold Demsetz have elaborated on Coase's ideas concerning firms, transaction costs, and contracts. Coase's insights have been widely applied by economists and political scientists to elucidate the functioning of organizations beyond just firms, influencing the development of the New Institutional Economics.

Coase's inquiry revolves around why and under what conditions firms come into existence, given that production could theoretically occur without organizational structures. He examines the circumstances in which it becomes advantageous for an entrepreneur to hire employees rather than contracting out specific tasks. Contrary to traditional economic theory, which assumes market efficiency and thus favors contracting out, Coase highlights various transaction costs associated with market transactions. These costs, including search and information costs, bargaining costs, protection of trade secrets, and enforcement costs, can inflate the overall cost of obtaining goods or services via the market. Consequently, firms emerge when they can internally produce what they need while circumventing these transaction costs.

However, there are limitations to internal production, as indicated by diminishing returns associated with managerial overhead costs and the propensity for errors in resource allocation. Coase argues that the size of a firm is determined by finding an optimal balance between the benefits and costs outlined above. Larger firms initially enjoy advantages, but eventually encounter diminishing returns, preventing indefinite

growth. Factors influencing firm size include the ease and cost of organizing transactions, the likelihood of managerial errors, and the impact on the supply price of production factors. Spatial distribution and dissimilarity of transactions also play a role, with technology advancements mitigating transaction costs and potentially enlarging firms. Notably, Coase's analysis excludes non-contractual relationships, such as those within friends or family circles.

Ronald Coase introduced his transaction cost theory of the firm in 1937, marking one of the earliest attempts within neoclassical economics to conceptualize the firm's relationship with the market. A key aspect of this theory is its adherence to constant returns to scale, rather than relying on increasing returns to scale. Coase presents a realistic definition of the firm compatible with conventional economic analysis, emphasizing that a firm's internal resource allocation is under its control while its interactions with the market may not be.

Coase explores various reasons why firms might emerge but ultimately dismisses them as insignificant. Instead, he argues that the primary rationale for establishing a firm is to circumvent transaction costs associated with the price mechanism, such as the costs of discovering relevant prices, negotiating contracts, and dealing with uncertainty. He observes that operating internally under the market system would necessitate numerous contracts for even minor transactions, leading to complexity and inefficiency. In contrast, real firms have relatively few but more complex contracts, particularly regarding long-term relationships in uncertain environments, which deviates from neo-classical economic theory's instantaneous market assumptions.

Coase highlights that government interventions in the market, such as sales taxes and price controls, tend to increase the size of firms by reducing transaction costs that firms would face internally. He defines a firm as "the system of relationships which comes into existence when the direction of resources is dependent on the entrepreneur," indicating that a firm expands or contracts based on the entrepreneur's decisions regarding transaction organization.

The size of the firm, according to Coase, is determined by the balance between the costs of using the price mechanism and the costs of organizing transactions internally. Diminishing returns to management play a significant role in raising the costs

of organizing larger firms, particularly in conglomerates with diverse operations or in dynamic market conditions.

In conclusion, Coase asserts that the firm's size hinges on the comparative costs of using the price mechanism versus internal organization, as well as the efficiency of other entrepreneurs' organization. These factors collectively dictate the firm's production output and allocation of resources.

3.1.2. Williamson: Evolution and formalization of Transaction cost theory

The transaction cost theory of Coase (1937) was formalized by Williamson who pioneered the development of the theory of transaction cost into a formalized and testable theory.

Williamson (1975) presents a critique of Coase's notion that firms exist to economize on transactions, arguing that Coase's explanation fails to address why internal organization doesn't completely replace market transactions. Williamson introduces a framework to analyze organizational failure, which revolves around two categories of factors: human and environmental.

Within the realm of human factors, Williamson highlights two key aspects: bounded rationality and opportunism. Bounded rationality challenges the assumption of full rationality prevalent in neoclassical economics, acknowledging the limited cognitive capacity of individuals to process and store information effectively. Additionally, individuals may struggle to articulate their ideas and knowledge, hindering effective communication. Opportunism refers to individuals acting in self-interest beyond the assumptions of neoclassical economics.

Environmental factors, influenced by human factors, contribute to complexity and uncertainty. Bounded rationality introduces complexity into transactions, while opportunistic behavior leads to uncertainty. Williamson suggests that if markets were as efficient as Coase suggests, firms wouldn't be necessary. However, due to these factors, there's a requirement for institutional support to ensure market efficiency. Legal frameworks are crucial in safeguarding transacting parties from opportunistic behavior, thus facilitating efficient transactions in the market. Institutions play a crucial role in monitoring and enforcing contracts, but this support comes with its own costs, such as hiring brokers or lawyers, which adds to transaction expenses. Consequently, efforts to mitigate opportunistic behavior create a distinction between transactions within firms

and those within the market. Market transactions are not as efficient; transactions within firms tend to be relatively less costly, providing a rationale for the existence of firms that Coase (1937) didn't explicitly address.

Williamson proposes that each transaction can be characterized by several factors: the feasibility of complete contracts, the risk of opportunism, the level of asset specificity or unique investment involved, and the frequency of the transaction. The nature of the transaction, whether it's a one-time exchange or a repeated interaction, also influences governance structures' costs, as highlighted by Williamson (1985). Larger and more frequent transactions can justify the investment in specialized governance structures, which can be recovered over time.

These characteristics affect transaction costs differently. For example, in repeated exchanges, both parties tend to reduce opportunistic behavior since there's a prospect of future interactions. Unlike Coase's emphasis on uncertainty, Williamson argues that market failure arises from the interaction between uncertainty and human factors, rather than uncertainty per se.

3.1.3. The development of the transaction theory by Hart (1986, 1990, 1997)

Grossman and Hart (1986) propose a different perspective on what defines a firm, asserting that true firmhood is characterized by asset ownership. They argue that ownership of assets is crucial because conflicts or disagreements may arise between parties involved in contracts, such as suppliers, workers, or managers, either due to unforeseen circumstances or because renegotiation becomes mutually beneficial.

Their argument maintains the concept of relationship-specific rents, emphasizing the importance of preserving specific relationships. However, rather than focusing solely on transaction costs, they highlight the advantageous bargaining position of asset owners in case of disputes. The owner of an asset, they argue, has greater leverage during renegotiation and is thus positioned to secure a larger share of rents. Therefore, the person who owns an asset should be the one most incentivized to enhance its value, considering the future distribution of rents.

Baker and Hubbard (2004) offer an empirical illustration of this concept using the example of long-haul trucks equipped with on-board computers. As the use of these computers became widespread, ownership of trucks shifted from individual owner-operators to trucking firms. The introduction of computers addressed issues related to

monitoring and controlling truck usage, making it more advantageous for trucking firms to own the assets.

In Grossman and Hart's theory of 'residual control rights,' the allocation of ownership is determined by which party can better influence actions relevant to the relationship. They argue that if residual control rights are significant, as demonstrated by the impact of asset ownership on relationship dynamics, ownership by the firm becomes optimal. Conversely, if relationship-specific rents are negligible and contracting is comprehensive, the flexibility to explore alternative relationships becomes more valuable than asset ownership.

Hart and Moore (1990) extend this model to scenarios involving multiple assets and firms, suggesting that sole ownership of complementary assets optimizes outcomes. By concentrating ownership of complementary assets, bargaining power is consolidated, encouraging investment in asset quality and improvement. Hart et al. (1997) offer further insights into residual control rights, illustrating why certain services, such as prisons, are better managed by governments than others, such as garbage collection.

3.2. Summarize the neoclassical theory of firm growth

Coase, Williamson, and Hart provide valuable insights into the variation in transaction costs within and outside firms, highlighting the importance of relationship maintenance costs. Additionally, Hart's emphasis on the impact of asset ownership and decision-making authority on investment incentives offers crucial perspectives. However, even in their most nuanced forms, these theories have limitations in fully explaining the dynamics of firms.

While these theories shed light on certain aspects of firm behavior, they may not comprehensively address all factors influencing firm operations. There are aspects of firm behavior and organization that remain unexplained or inadequately addressed by these theories. Therefore, while these theories offer valuable frameworks for understanding firm behavior, they may not fully capture the complexity and dynamics of real-world firms.

3.3. Penrose's "The theory of the growth of firm"

The most fundamental research to mention is Penrose's theory of business growth, which states that the factors influencing the rate of business growth are

managerial capabilities and the ability to coordinate the resources of the business in production.

Penrose defines a firm as a collection of (productive) physical and human resources. It is 'an administrative planning unit, the activities of which are interrelated and are coordinated by policies which are framed in the light of their effect on the enterprise as a whole' (pp.15-16). This model of the firm has a central managerial discretion responsible for general policies. The areas of coordination and authoritative communication define the boundaries of the firm. The firm is more than an administrative unit, and is 'a collection of productive resources the disposal of which between different users and over time is determined by administrative decisions' (pp.24).

Penrose's theory of business growth explores two key concepts: the resources push and managerial limits to growth. She focuses on analyzing resources and identifying factors that impede business growth. According to her, efficient resource utilization and managerial capabilities are essential for business growth. Penrose insists that her research focuses on investigating the causes and constraints of business growth... The central research question examines the economic factors that promote or hinder business growth.

In Penrose's view, businesses are entities that leverage resources in specific ways. She examines the production process and competitiveness to elucidate business growth. Through her research, Penrose identifies two key issues: the resources and factors utilized in production, and the relationship between production factors and opportunities. Thus, resources themselves are not merely inputs; they contribute to business growth when integrated into the production process in specific ways. Businesses utilize resources based on factors such as experience, managerial capabilities, workforce skills, and strategic approaches. Consequently, the outcomes derived from resources hinge on their utilization methods, purposes, combinations, and quantities, leading to varied results (Kor and Mahoney, 2004).

The utilization of inherited managerial resources determines the capacity for integrating new managerial resources, imposing a fundamental and unavoidable constraint on the extent of expansion a firm can pursue at any given time (pp.48). In smaller firms, the process of planning and executing expansion tends to be sporadic, whereas in larger firms, it is ongoing. Substantial expansion typically necessitates both

the recruitment of new personnel and the promotion and reassignment of existing staff. Managerial experience manifests in two dimensions: the acquisition of new knowledge and the enhancement of the ability to apply it. Consequently, firms expand to capitalize on underutilized managerial expertise, known as managerial constraints on expansion. However, the firm's expansion initiatives are curtailed by escalating risks and uncertainties, particularly when the entrepreneur is presumed to be passive, which is rarely the case.

Entrepreneurs can mitigate risks and uncertainties by deploying managerial resources to gather additional information, contingent upon the competence and temperament of management. While managerial resources can mitigate risk and uncertainty to some extent, complete elimination is unfeasible. The managerial approach to risk constrains the firm's growth, as resources must be allocated between operational activities and risk containment/planning (for resource acquisition).

Typically, the growth of small firms is constrained by environmental factors, such as competitive pressures, regardless of their resources or entrepreneurial capabilities. The entrepreneur's perception of the environment, rather than its inherent conditions, plays a pivotal role. The relative scarcity of various resources in the broader economy influences individual firms through market prices for resources and finance. The expected profitability of expansion is determined by the firm's ability to identify opportunities for resource utilization, considering both the costs of other resources and external opportunities themselves (pp.216).

Access to capital and credit rationing poses a significant challenge for the growth of small firms. Only those smaller firms where the entrepreneur behind them demonstrates ingenuity in raising capital can thrive. Nonetheless, small firms persist due to various reasons. Some activities may not be viable for large firms, or small firms may exist due to public relations efforts by large firms. Additionally, certain industries may have low entry barriers, or large firms may not have yet absorbed smaller ones. Most small firms operate in the gaps left by large firms as they expand, unable to seize every opportunity that arises. The productive opportunities for small firms are thus found in these gaps, which they identify and exploit (pp.223).

Furthermore, as technological knowledge proliferates and becomes more widely accessible, it will create numerous unprecedented opportunities for smaller firms. The

growth rate of large firms is constrained by the ongoing efforts and investments required to maintain their competitive positions in specialized areas (pp.227).

Penrose is considered the first economist to propose what is now known as the resource-based view of the firm. Strategic resources are scarce, difficult to imitate, valuable assets that a company can control. Resources can be raw materials, such as gold mines or oil wells, or intellectual, such as patents, and even trademarks and brands.

3.4. Resource - based theory

The Resource-Based View (RBV) perspective, a foundational branch of resource theory, was proposed by Wernerfelt (1984), building upon previous research by Penrose (1959). Wernerfelt (1984) identifies that "traditional strategic concepts focus on the analysis of firm resources (strengths and weaknesses), while most orthodox economic tools tend to emphasize market control." He describes resources and products as "two sides of the same coin," and according to the resource-based view of the firm, a firm's market position is determined by its ownership of scarce resources.

This viewpoint was further developed by Dierickx and Cool (1989), Barney (1991), and Wernerfelt (1995). The core of Resource – based theory is to seek answers to why some businesses can gain a competitive advantage over others in the same industry based on the analysis of internal resources of the firm (Wernerfelt, 1984; Barney, 1986a). The resources of a firm are manifested in various forms. Accordingly, a firm's resources are divided into three main categories: tangible capital resources, human capital resources, and organizational capital resources (Barney, 1991). Tangible capital resources include factories, workshops, locations, and raw materials; Human capital resources such as knowledge, intuition, judgment, experience, and learning ability of laborers; and organizational capital resources include organizational machinery structure, coordination system within the organization, informal relationships within and outside the organization (Barney, 1991).

Another approach, Grant (1991) divides a firm's resources into two main types: tangible resources and intangible resources. Accordingly, tangible resources include financial resources such as equity, capital mobilization ability; Tangible assets such as production scale, factory location, production ingenuity, input materials, or flexibility, adaptability of the factory system. A firm's intangible resources include technological secrets or the reputation of the business. Technological secrets such as owning intellectual

property, patent inventions; Reputation includes factors such as famous brand, credibility, good relationships with suppliers, customers, government; Human resources such as knowledge, skills, loyalty, and employees' suitability with the business.

Wernerfelt (1984) also argues that if a business effectively utilizes certain special resources of the firm, it can create resource position barriers that will help improve its operational efficiency. However, not all resources can create a competitive advantage for the business. According to the Resource-Based View (RBV) perspective, a firm's competitive advantage originates from the resources that the firm possesses (Grant, 1991; Barney, 1991). The resources that create a competitive advantage have the following four characteristics, according to Barney's (1991) VRIN model:

- Valuable: A firm's resources can only create a competitive advantage or sustainable competitive advantage when they are valuable. Resources are valuable if they enable the firm to implement strategies to improve performance and business efficiency by exploiting opportunities and/or neutralizing threats in the firm's operating environment;

- Rare: Resources must be rare and difficult to find among competitors; otherwise, the advantage created from those resources will quickly be imitated by competitors. In fact, it is difficult to determine whether a firm's valuable resources are entirely unique to its competitors, but these resources will at least create a competitive advantage and may have the potential to create a sustainable competitive advantage. However, there may also be a small number of firms in the industry that possess a unique valuable resource and also create a competitive advantage. In general, as long as the number of firms owning particularly valuable resources is fewer than the number of firms needing to create perfect competitive drive in the economy, those resources have the potential to create a competitive advantage;

- In-imitable: Resources must be difficult to imitate perfectly in order to ensure a sustainable competitive advantage. Otherwise, competitors will copy the necessary resources to implement similar strategies as the firm in a short period of time. According to the mechanism of preventing resource transformation mentioned above, when the connection between a firm's resources and its sustainable competitive advantage is only partially understood, it will be difficult for competitors to imitate. Imitating firms may describe some of the successful firm's resources, however, they will not clearly see

whether the created resources resemble those that constitute the sustainable competitive advantage for the firm or not;

- Non-substitutable: Even though competitors cannot exactly imitate another firm's resources, they can still substitute them with similar resources that allow for implementing strategies similar to those of the firm possessing the special resources. Therefore, only when the non-substitutable characteristics are demonstrated can a new resource ensure the firm's sustainable competitive advantage.

Assuming that businesses in the same industry will apply different business strategies and cannot be copied because each business will own different resources, the authors of the Resource - based theory consistently argue that a firm's resources are the decisive factors for the competitive advantage and business efficiency of the firm.

Our study is motivated by the Theory of the growth of the firm and Resource – based theory that mainly focus on the connection between scarce resource and the growth of the firm. Following Grant (1991), we divide a firm's resources into two main types: tangible resources and intangible resources. Accordingly, tangible resources are financial resources; Tangible assets are technological innovation, including new products, improvements of technologies or processes, new technologies and processes. From the theoretical background, we have come up with two research questions: how credit access affects firm performance, and how innovation affects firm performance, especially in the context of a developing country like Vietnam where the financial markets remain imperfection?

CHAPTER 4: RESEARCH METHODS

4.1. The research context

Table 4.1: Enterprise size categories by capital scale and labor scale

	Micro-enterprise	Small-enterprise		Medium-enterprise	
	Number of employees (Person)	Total capital (VND billion)	Number of employees (Person)	Total capital (VND billion)	Number of employees (Person)
Agriculture, forestry, and fisheries	No more than 10	No more than 20	From more than 10 to 200	From more than 20 to 100	From more than 200 to 300
Industry and construction	No more than 10	No more than 20	From more than 10 to 200	From more than 20 to 100	From more than 200 to 300
Trade and services	No more than 10	No more than 10	From more than 10 to 50	From more than 10 to 500	From more than 50 to 100

Source: Vietnamese Government, Decree No.56/2009/ND-CP

In Vietnam, Small and Medium Enterprises are defined by Decree 56/2009/ND-CP of the Government, issued on September 30, 2009, aimed at supporting their development. According to this decree, SMEs are business entities registered according to the law, categorized into three levels: super small, small, and medium, based on either their total capital size or the number of employees, with total capital being the primary criterion. However, the newly enacted Law on Facilitating SME Sector (No. 04/2017/QH14) provides an updated definition, considering an enterprise as an SME if it meets either of the following criteria: (i) total capital not exceeding VND 100 billion, or (ii) total turnover of the preceding year not exceeding VND 300 billion. It is noteworthy that micro-enterprises, small enterprises, and medium enterprises are identified differently across various sectors, including agriculture, forestry, and fisheries; industry and construction; as well as trade and services.

SMEs hold a significant and unique position within economies, including those of developed countries. Their importance is underscored by several key attributes:

Contribution to Economic Output: SMEs play a vital role in providing a substantial quantity of goods and services to the economy, representing the majority of enterprises in terms of total production and business establishments. Moreover, the growth rate of SMEs often outpaces that of larger enterprises. Notably, SMEs make a significant contribution to Gross Domestic Product (GDP); in Vietnam, for instance,

SMEs account for nearly 45% of the country's GDP, as reported by the General Secretary of the Association of SMEs Vietnam.

Job Creation and Income Generation: SMEs serve as a crucial source of job creation across various industries. In Vietnam, SMEs have been instrumental in generating over 1 million jobs annually, according to the Vietnamese Association of SMEs. This contribution to employment not only supports economic growth but also improves living standards and addresses social security concerns.

Investment Attraction and Resource Utilization: SMEs attract investment capital into the economy while effectively exploiting and allocating resources. Their development serves as a driving force for economic growth and can be observed across various business forms, including state-owned enterprises, private enterprises, joint-stock companies, and those with foreign investment. Bui Thi Thu Ha (2011) highlighted that SMEs utilize approximately 49% of the country's workforce.

Dynamic Contribution to the Economy: SMEs contribute to the dynamism of the economy by constantly adapting to the business environment. Their ability to evolve and respond to market demands is a key factor in their resilience. The fluid nature of SMEs allows them to swiftly adjust their products and operations, contributing to a more dynamic economy. Additionally, SME managers are under pressure to innovate and implement changes that align with economic shifts, necessitating agility and flexibility to remain competitive in the market. In short, SMEs have a very important role in any economy, especially in the developing countries. This is the driving force that helps the economy develop dynamically.

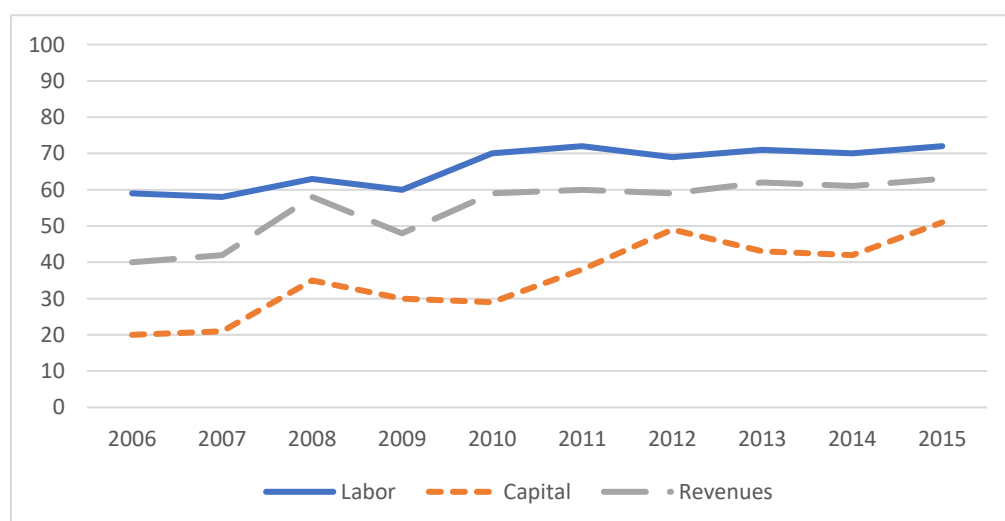


Figure 4.1: Contributions of SMEs to business sector in Vietnam, 2006-2015 (%)

Source: VEPR (2018)

In general terms, SMEs, including micro-enterprises, have played a substantial role in the economy during the period spanning 2006 to 2015. Despite constituting approximately 70% of the total employment within the business sector, which encompasses both SMEs and large enterprises, SMEs have accounted for roughly 50% of the total capital and have contributed to around 60% of the total sales within this sector. When factoring in micro-enterprises, these figures would further rise to 90% for employment, 80% for total capital, and 85% for total sales, highlighting the significant impact and prevalence of SMEs and micro-enterprises in the economy

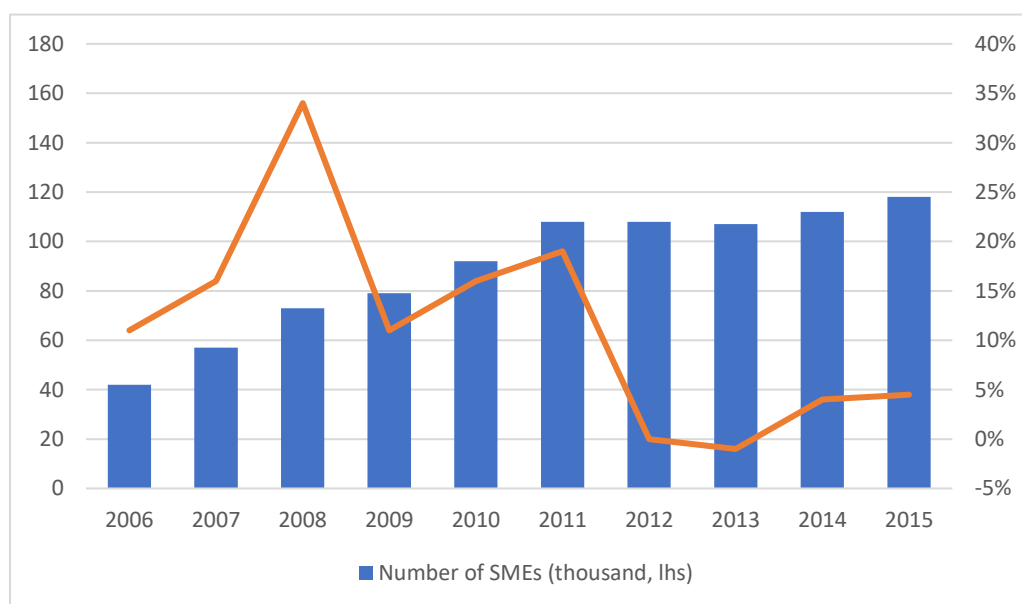


Figure 4.2: Number of SMEs in Vietnam, 2006-2015

Source: VEPR (2018)

The SME sector in Vietnam experienced a notable surge in the number of enterprises between 2006 and 2015, as depicted in Figure 4.2. Specifically, starting from approximately 45 thousand enterprises in 2006, the number of SMEs surged to over 120 thousand by 2015, marking a growth of roughly 2.6 times compared to the initial figure. The average growth rate during this period stood at approximately 14% per year. Notably, while SME growth rates were notably high between 2006 and 2011, averaging 19% annually, recent years have witnessed a slowdown, with an average growth rate of 2%. This trend reflects the economic challenges faced during this period. However, there were some positive signs in 2015, with a higher growth rate compared to the preceding two years. Our analysis (not presented here) also indicates significant growth in micro-enterprises during the same period. Specifically, the average growth rate for micro, small, and medium enterprises (MSMEs) was 30% and 10% during the periods of 2006-2011 and 2011-2015, respectively.

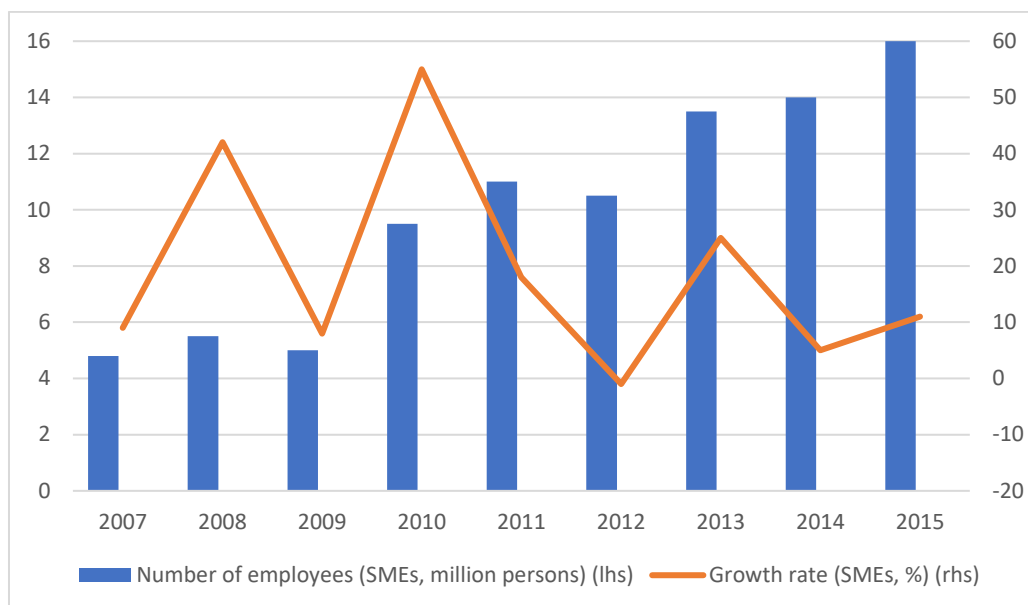


Figure 4.3: Total employment of SMEs in Vietnam, 2006-2015

Source: VEPR (2018)

A similar growth pattern could also be seen in the total employment of SMEs during the 2006-2015 period, as shown in Figure 4.3. In particular, if the 2006-2011 period witnessed an increasing growth in the number of employees, with the average rate of around 25 percent per year, the latter period experienced declining growth rate of only 10 percent per year. Similar can be observed for the MSME sector. The growth trend of SME (MSME) employment is similar to that of the total business sector (VCCI, 2016), suggesting that the number of new jobs created in the past several years has dropped dramatically.

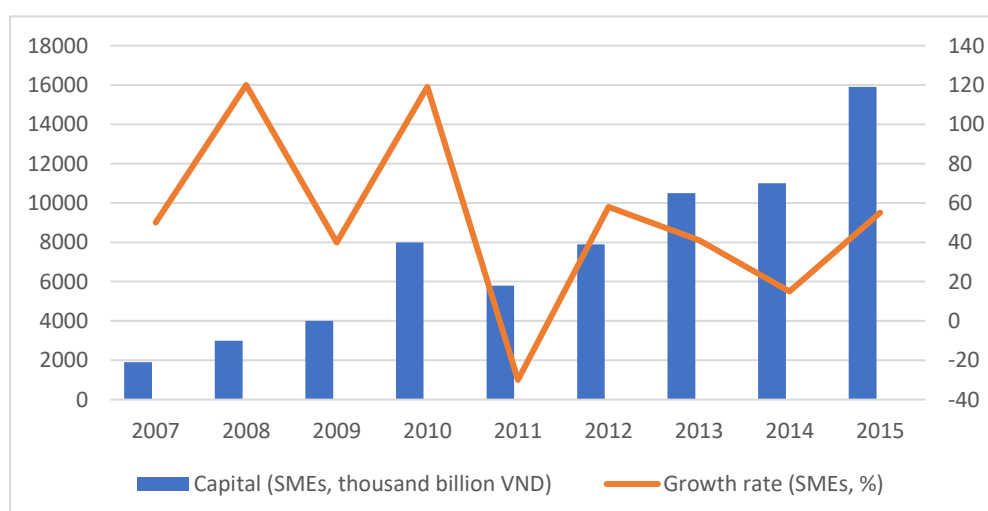


Figure 4.4: Total capital of SMEs in Vietnam, 2006-2015

Source: VEPR (2018)

Figure 4.4 shows the growth of the total capital of SMEs in Vietnam. If the average growth rate of total capital was pretty high during 2006-2010, roughly 50% per annum.

We will review the literature on the barriers to the sustainable development of SME sector in Vietnam. Obstacles are grouped into two categories: internal and external factors.

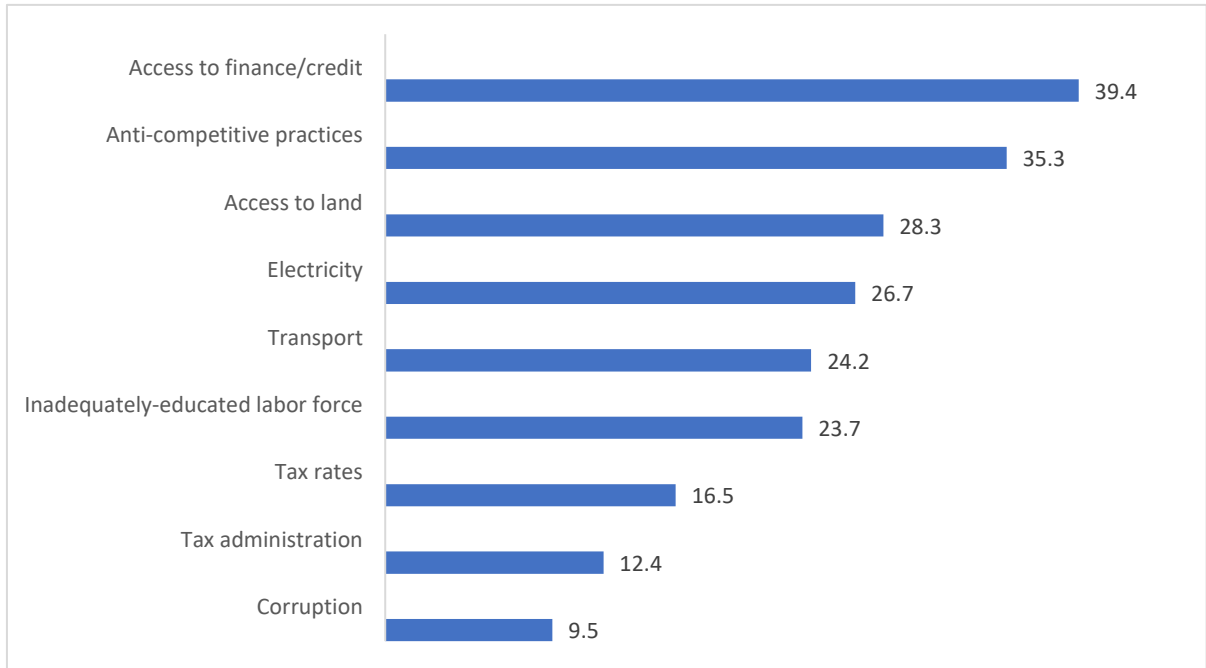


Figure 4.5: Major obstacles SMEs face in Vietnam (% of SMEs)

Source: Wignaraja (2013)

Internal Factors

The primary internal barriers encountered by SMEs include limited management and technological capabilities. Despite notable improvements in management capacity over time, certain weaknesses persist, particularly in terms of leadership qualifications and experience in management skills among SME leaders. According to a recent survey conducted by JETRO (2017), a significant proportion, up to 55.6%, of SME business managers in Vietnam lack adequate knowledge, particularly in areas such as business and corporate governance, and business law. Empirical evidence suggests that poor managerial skills pose a disadvantage for all enterprises, with SMEs being the most adversely affected (Ketels et al., 2010). Specifically, the absence of training and necessary skills results in a lack of vision and proactivity among leaders in conducting their business affairs. Consequently, strategic business planning to achieve long-term goals becomes challenging, with businesses often operating based on limited experience

and short-term plans, and seizing temporary opportunities. Such characteristics increase the likelihood of enterprises encountering significant difficulties in human resource and financial management as they expand, potentially leading to poor performance and inefficiencies in cost management.

Regarding technological capability, Tran Tien Cuong et al. (2007) delineate three stages of technology development: adoption, mastering, and creation, noting that Vietnam remains primarily at the adoption stage. A survey conducted by NASATI (2009) reveals that Vietnamese enterprises allocate minimal resources to research and development (R&D) and innovation, both in absolute and relative terms, with R&D activities predominantly concentrated in large enterprises. Nguyen Thi Tue Anh and Luu Minh Duc (2010) further highlight the limited presence of scientists within SMEs, with only 4 per 1,000 enterprises, compared to figures of 94 and 31 per 1,000 enterprises for state-owned enterprises (SOEs) and foreign-invested enterprises, respectively. This disparity may stem from various factors, including restricted access to resources such as capital and production premises, as well as inadequate and ineffective government policies, which will be examined in the subsequent section.

External Factors

External factors such as access to finance/credit, land, physical infrastructure, labor force, and competition from informal sector practices are identified as primary obstacles for SMEs, as outlined by Wignaraja (2013). Among these challenges, access to finance emerges as particularly severe for SMEs in Vietnam. The issue of financial accessibility highlights a significant disparity between the formal credit needed and the actual credit provided to SMEs, leading to an undersupply of credit amounting to approximately US\$ 42 thousand per enterprise in 2011. Notably, SMEs predominantly rely on internal sources, accounting for nearly 80% of their investment financing, rather than seeking external sources (Yoshino and Wignaraja, 2015). Those SMEs that do seek external finance tend to opt for non-bank sources over banks, with borrowers from banks typically undergoing financial audits, being older establishments, and engaging in exporting activities (Wignaraja and Jinjarak, 2015).

Various factors contribute to the undersupply of credit, including asymmetric information, high default risk, and a lack of collateral. Specifically, challenges in appraising SME business plans, especially for those operating in new or specialized fields, along with difficulties in cash flow control due to limited enterprise information, deter credit institutions from extending loans to SMEs. Notably, collateral in the form

of land, buildings, and personal assets of SME owners holds significant importance for securing loans from banks (Le, 2012; Wignaraja and Jinjarak, 2015). Additionally, the absence of a central-level agency specializing in providing financial services support for startup firms represents a governmental barrier to SME financing.

In 2013, approximately 23.7% of SMEs in Vietnam reported the inadequately educated labor force as a problem, which partly reflects skill shortages and rising labor costs attributed to full employment status. The acute shortage of qualified human resources within SMEs can largely be attributed to demand-side constraints in the labor market, as highlighted by the OECD and the World Bank (2014). According to the Vietnam Institute for Economic and Policy Research (2017), Vietnam witnessed a 1.5-fold increase in average real wages during the period from 2007 to 2015. Concurrently, payments towards social security, including social insurance, health insurance, and unemployment insurance, have also escalated over time.

Tax policies, encompassing the types and levels of taxation, are believed to significantly influence the incentive for innovation among enterprises, as well as the returns derived from innovation. Among various types of taxation, corporate income tax and capital gains tax are deemed as the most influential factors affecting business investment, as indicated by the OECD (2013). Despite concerted efforts by the Vietnamese government to address inefficiencies and ease the burden on SMEs—such as permitting SMEs to defer value-added tax payments, simplifying tax administration procedures, reducing compliance burdens, and offering preferential tax rates—shortcomings persist in the tax policy.

It is important to acknowledge that corruption, in the form of unofficial charges or fees from government administrative offices, continues to pose a significant burden on SMEs. Nearly 10% of SMEs surveyed reported experiencing issues related to corruption, with some instances involving high levels of bribery, constituting 10-20% of the total costs (Wignaraja, 2013; JETRO, 2017).

The constraints stemming from limited human and financial resources, as well as the absence of information and support services, necessitate a targeted response from the government. Increased competition resulting from trade liberalization and the presence of multinational enterprise (MNE) activity have demonstrated a positive impact on the innovation activities of SMEs (Nguyen Ngoc Anh et al., 2011). Therefore, Vietnam's greater openness to trade could potentially create more opportunities for technology transfer and adaptation for enterprises across the board, especially benefiting SMEs.

In Vietnam, SMEs account for 95% of total enterprises nationwide, create about 77% of total employment, and contribute up to 48% of GDP (VCCI, 2013). Regardless of their significance in the economy, SMEs appear to face multiple risks such as loss of major suppliers, failure of a partnership, competitiveness from other enterprises, etc. Among the obstacles that SMEs have confronted, the shortage of and difficulty in access to capital are likely to be the most serious problems, followed by the competitiveness, the restriction on the demands for products, the difficulties in land access and business premises (Clusel et al., 2013). A study by Nguyen, Su and Sharma (2019) affirms that SMEs often encounter more financial obstacles than do their large counterparts – such as inadequate collateral, high interest rate, or complex process of credit application.

A recent study conducted by the Japan External Trade Organization (JETRO) (2017) found that SMEs in Vietnam have been encountering different barriers, of which three main obstacles include lack of financial accessibility, the ineffectiveness of support from the government, and limited business capacity. These challenges need to be addressed to enhance their contribution to the economy and ensure sustainable growth.

Access to credit remains a critical issue for Vietnamese SMEs. Many SMEs struggle to secure formal credit from banks and other financial institutions due to stringent lending criteria, lack of collateral, and limited credit history. According to a 2019 survey by the Vietnam Chamber of Commerce and Industry (VCCI), only about 30% of SMEs were able to access formal credit, with the majority relying on informal sources such as personal savings, family, and friends.

Formal credit access is often limited by the perceived high risk associated with lending to SMEs, which are seen as less stable and more likely to default compared to larger firms. This has led to a reliance on informal credit sources, which typically come with higher interest rates and shorter repayment periods, further constraining the growth potential of SMEs.

Innovation is crucial for the competitiveness and growth of SMEs. However, many Vietnamese SMEs face significant barriers to innovation, including limited access to finance, lack of skilled labor, and insufficient infrastructure. Innovation in SMEs can be categorized into three main types: Product Innovation: Introducing new products or significantly improving existing ones; Process Innovation: Implementing new production processes or enhancing existing ones; Technological Innovation: Adopting new technologies to improve efficiency and productivity.

A 2020 survey by the Ministry of Planning and Investment indicated that while some SMEs are engaged in innovative activities, the overall level of innovation remains low. Only about 20% of SMEs reported introducing new products or processes in the past three years. The lack of innovation is often attributed to financial constraints, limited access to technology, and inadequate support from the government and industry associations.

The performance of SMEs in Vietnam is influenced by their ability to access credit and innovate. Firms with better access to credit are more likely to invest in new technologies, expand their operations, and improve their productivity. Similarly, innovative firms tend to have higher growth rates, increased competitiveness, and better market positioning.

However, the overall performance of Vietnamese SMEs remains uneven. While some SMEs have achieved significant growth and success, many continue to struggle with low productivity, limited market access, and intense competition from larger firms and foreign enterprises.

4.2. Research methodology

4.2.1. Data

This study employs data from two surveys conducted in Vietnam, namely the Vietnam SME Survey and the Provincial Competitiveness Index (PCI) Survey. The first survey was biennially carried out from 2007 to 2015 in ten cities and provinces across Vietnam (Ha Noi, Phu Tho, Ha Tay, Hai Phong, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Hochiminh City, and Long An). Although Ha Tay has been merged into Ha Noi since 2008, it has still been used as a separate province to ensure the consistency of the sample over years and make it comparable to previous surveys. This was the research collaboration among the Central Institute for Economic Management (CIEM, Vietnam), the Institute of Labour Science and Social Affairs (ILSSA) (MOLISA, Vietnam), and the University of Copenhagen (Denmark), under the sponsorship of the Danish International Development Agency (DANIDA). The purposes of these jointly research efforts between Vietnam and Denmark were to collect data and provide fresh evidence on the actual dynamics and growth of the private sector in Vietnam during nearly one decade. No further survey has been undertaken, and therefore, there is no additional data, since 2015.

The second data source comes from the Vietnam Provincial Competitiveness Index Survey, conducted annually since 2005 under the collaboration between the Vietnam Chamber of Commerce and Industry (VCCI) and the United States Agency for International Development (USAID). The PCI data is provincial-level and used to assess the governance quality of a local province in constructing a favourable business environment for the development of private enterprises. This survey has covered many aspects of the Vietnam's business environment, including entry costs for business start-up, easy access to land, a transparent business environment and equitable business information, informal charges, time costs for bureaucratic procedures and inspections, proactive and creative provincial leadership in dealing with obstacles for enterprises, developed and high-quality business support services, labour training policies, fair and adequate legal procedures.

Combining data from two surveys enables us to generate a unique longitudinal data set in firm level and at the provincial level. Information of 10 among 64 provinces in the second data source is taken into account in accordance with those in the first source, in the corresponding years, to ensure the consistency when merging data from two separate sources. The 2006 PCI is used instead of 2005 because it covered all cities and provinces in the country, including Phu Tho and Lam Dong, which were not surveyed in the 2005 PCI. As the first PCI survey was carried out in late October 2005, information and indices of the 2006 PCI is well-matched with those of 2005 (Vu et al., 2016).

There were over 2,500 manufacturing SMEs involved in the firm-level survey in each survey round. The population of surveyed SMEs in the ten selected provinces rested on two data sources by the General Statistics Office of Vietnam, including the Establishment Census and the Industrial Survey. Once the population was identified, the interviewer visited each enterprise in the selected provinces and interview the owner or manager, who retains effective control of the firm, to collect data and information. The response rate reached 98 percent across survey rounds. Data were initially checked and cleaned up in the field. In the next step, the surveyor along with the research group continued processing the collected primary data and information, and combined with data files from previous survey rounds to ensure the consistency. The SME survey covered both registered firms, known as formalised firms, and unregistered ones, which did not register under laws. The informal firms, also known as household enterprises, were selected for the Survey based on the determination at their locations. These firms did not

hold licensed business registration or tax identification number and not register with the local government. All informal enterprises were in parallel with their counterparts to serve the process of forming data sets, data collection, policy analysis and implications for the local and central governments.

4.2.2. Description of variables

Our study uses self-reported information of managerial respondents to construct variables with details as follows:

4.2.2.1. Firm performance:

In this study, we use labor productivity, revenue and value added as measurements of firm performance.

Labor productivity as firm performance's measurement

At the firm level, productivity serves as a crucial gauge of how efficiently production factors are utilized. Productivity measures can encompass labor productivity, such as value-added per worker or per worker hour, or less commonly, capital productivity, like value-added per unit of fixed capital stock, which is closely tied to the types of technology utilized, often labor- or capital-intensive technology. Another significant measure is firm-level total factor productivity (TFP) (Gal 2013). It's worth noting that in cases where output data is unavailable, deflated firm sales may serve as a proxy for output, although the reliability of this proxy hinges on the quality of the deflator and the homogeneity of the produced goods (Melitz 2000). Key factors influencing productivity include firm size, which captures economies of scale, as well as process and organizational innovation.

By virtue of the importance of labor productivity in firm performance and growth, our study investigates the labor productivity of SMEs in Vietnam under the effect of credit access and innovation.

Revenue and value added as firm performance measurements

We also capture firm performance by revenue from sales and value added to identify the relationship between access to credit, innovation and firm performance, following the previous studies (Lee, Wang and Ho, 2020; Latify, Nikou, and Bouwman, 2021)

Firm performance is considered a multi-dimensional concept that can be proxied

by finance-, production-, and/or marketing-related indicators (Murphy, Trailer, and Hill, 1996; Sohn et al., 2007). Our study examines the relationship between access to credit, innovation and firm performance with focus on production-related indicators to capture firm performance. We explain that our data are employed from the secondary data source that collected responses from the Vietnam Manufacturing SME Survey which limits the use of financial indicators, such as share price and/or stock market-related information. The survey sample focuses on manufacturing SMEs, thus the use of production-related data to measure firm performance is appropriate. In this study, we measure firm performance by revenue from sales (in logs) and value added (in logs), following previous studies (e.g., Tuan et al., 2016; Le et al., 2023). For robustness check, we use firm growth, measured by the difference of logarithm of revenue in year t and logarithm of revenue in year $t-1$ (Lee, Wang, and Ho, 2020; Latifi, Nikou, and Bouwman, 2021).

4.2.2.2. Access to credit

We measure firm's credit access by a dummy variable in which a firm is considered to have credit access if it obtained either short term or long-term loans or if a firm had informal loans. The combination of formal and informal financing allows us to make a comprehensive analysis on the probability of SMEs having credit access as well as to examine the effect of both capital sources on firm performance. We apply a two-stage regression method with the random-effects logit in the first stage and the random-effects instrumental variable regression in the second stage to address the endogeneity issues.

The dissertation employs a dummy variable for credit access to examine the impact of credit availability on firm performance, categorizing firms as either having access to credit or not. This binary approach simplifies the analysis and focuses on whether access to credit, regardless of the amount, significantly affects metrics such as growth, productivity, and profitability. This method is particularly relevant in the context of Vietnamese SMEs, where obtaining credit can be a major hurdle and having any access to credit might lead to significant improvements in business outcomes. This approach has limitations as it does not account for the size of the credit obtained.

4.2.2.3. Innovation:

Innovation is the key independent variable in this research. We construct this

variable based on the three sub-questions in the survey questionnaire as follows: “Has the firm introduced new product groups since the last survey?”, “Has the firm made any improvements of existing products or changed specification since the last survey?”, and “Has the firm introduced new production processes/new technology since the last survey?”. Respondents provide the answers of Yes, No, or Don’t know. We eliminate observations with missing information and code data with 1 for Yes and 0 for No. Responses from the above three questions are consolidated into a dummy variable, which takes the value of 1 if the firm’s representative responded “Yes” to at least one of those three questions above, suggesting that the firm had introduced new products, or made improvements of existing products or changed specification, or introduced new production processes or new technology since the last survey, and zero otherwise (see, e.g., Archer, Sharma, and Su, 2020).

4.2.2.4. Control variables:

We follow previous studies (e.g., Archer, 2019; Kiss, Cortes, and Herrmann, 2022; Nguyen, Su, and Sharma, 2019; Tran and Santarelli, 2013) to explore a vector of variables to control for firm’s characteristics, including liabilities (in logs), firm age, firm size, investment, competition, machine, outsourcing, network size, gender, and owner’s age. Year and location effects are also included.

Details of variables are described in Table 4.2.

Table 4.2. Description of Variables

Variable	Definition	Literature
<i>Dependent variable</i>		
Labour productivity (log.)	The ratio of revenue to the number of labours of a firm.	Xuefeng and Yasar (2016); Waheed (2017)
Revenue	The logarithm of revenue from sales.	Lee, Wang and Ho, 2020; Latify, Nikou, and Bouwman, 2021
Value added	The logarithm of total value added, which equals to value of production or manufactured output minus total indirect costs minus value of raw materials used.	Lee, Wang and Ho, 2020; Latify, Nikou, and Bouwman, 2021
Growth	The difference of logarithm of revenue in year t and logarithm of revenue in year t-1.	
<i>Independent variables</i>		
Access to credit	Dummy variable, taking 1 if a firm obtained either short term or long term formal loan(s) or if a firm had informal loan(s), and 0 otherwise.	Le (2012); Nguyen and Luu (2013); Tran and Santarelli (2013)
Innovation	Dummy variable; =1 if a firm had introduced new products, or made improvements of existing products or changed specification, or introduced new production processes or new technology since the last survey; = 0 otherwise.	Archer, Sharma, and Su, 2020
New products	Dummy variable; =1 if a firm had introduced new products since the last survey; = 0 otherwise.	Archer, Sharma, and Su, 2020
Improved products	Dummy variable; =1 if a firm had made improvements of existing products or changed specification since the last survey;	Archer, Sharma, and Su, 2020

Variable	Definition	Literature
	= 0 otherwise.	
New processes	Dummy variable; =1 if a firm had introduced new production processes or new technology since the last survey; = 0 otherwise.	Archer, Sharma, and Su, 2020
Firm age	The age of firm in years, calculated by the difference between the survey year and firm's establishment year.	Motta (2020); Rahaman (2011)
Assets (log.)	Firm economic size, measured by the logarithm of total assets.	Rahaman (2011)
Registration	Dummy variable, taking 1 if a firm registered under the Law on Enterprises or if a firm has Business Registration Application and 0 otherwise.	Archer (2021); Wellalage and Locke (2016)
Investment	Dummy variable, taking 1 if a firm has made any investment since the last survey and 0 otherwise.	Tran and Santarelli (2013)
Competition	Dummy variable; =1 if a firm faced competition in their field of activity; = 0 otherwise.	Tran and Santarelli (2013)
Machine	Dummy variable; =1 if a firm used both manually and power driven machinery; = 0 otherwise.	Tran and Santarelli (2013)
Outsourcing	Dummy variable; =1 if a firm outsourced production in the last survey; = 0 otherwise.	Awe, Kulangara and Henderson (2018)
Network size	The number of people that a firm (approximately) had currently regular contact with (contact at least once every three months, which the firm found useful for their business operations).	Tran and Santarelli (2013)
Party member	Dummy variable, taking 1 if the owner is a member of the Communist Party and 0	Nguyen and Luu (2013)

Variable	Definition	Literature
	otherwise.	
Owner's age	The age of owner/manager in years, calculated by the difference between the surveying year and the owner's year of birth.	Nguyen, Sharma and Su (2019)
Gender	Dummy variable, taking 1 if owner's gender is male and 0 if female.	Motta (2020); Nguyen, Sharma and Su (2019)
Education	Dummy variable, taking 1 if the owner completed an undergraduate or a postgraduate program and 0 otherwise (No professional education, Vocational education, Technical secondary education).	Nguyen, Sharma and Su (2019); Nguyen and Luu (2013)
Urban	Dummy variable, taking 1 if a firm is located in urban cities (Ha Noi, Hai Phong, Ho Chi Minh City) and 0 otherwise.	Nguyen and Luu (2013)
PCI ranking	The ranking of a province based upon its overall score of Provincial Competitiveness Index.	Cao (2014); Le (2012)
<i>Control variables</i>		
Distance	Ordered variable, taking 0 if no distance, 1 if the distance is below 5 kilometres, and 2 if the distance is above 5 kilometres.	Ellis et al. (2010)
Credit history	Dummy variable, taking 1 if a firm has borrowed from the main creditor (formal or informal) before and 0 otherwise.	Krasniqi (2010)

4.2.3. Characteristics of the sample

The data has been collected through a survey carried out in nine provinces of the country: Hanoi (including Ha Tay), Hai Phong, Ho Chi Minh City, Phu Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, and Long An. The data are based on face-to-face interviews with firm owners/managers and employees and are typically collected in the months of June-August.

The enterprises surveyed are distributed across approximately 18 sectors such as: food processing, fabricated metal products, and manufacturing of wood products. Enterprises are classified according to the current World Bank definition, with micro-enterprises having up to 10 employees, small-scale enterprises up to 50 employees, medium-sized enterprises up to 300 employees, and large enterprises having more than 300 employees.

The population of non-state manufacturing enterprises in the selected provinces is based on two data sources from the General Statistics Office of Vietnam (GSO), the Establishment Census from 2002 and the Industrial Survey of 2004–06. The number of individual business establishments that do not satisfy the conditions stated in the Law on Enterprises of Vietnam—also referred to as household enterprises—are obtained from the Establishment Census. This information is combined with data on private, collectives, partnerships, limited liability, and joint stock enterprises, formally registered under the Law on Enterprises at the province level from the Industrial Survey. Joint ventures, including those with state involvement, have been excluded from the sampling framework due to the unclear nature of government involvement in such ownership structures.

Stratified sampling was used to ensure an adequate number of enterprises in each province with different ownership forms. It is important to note that the sample of informal firms is not representative of the informal sector in Viet Nam, since the sampling scheme of the survey is based on the GSO business censuses and surveys, which cover only part of the informal sector.

In each round, data is collected from employees in 500-600 randomly selected enterprises under the employee module. Note that the employee data are not representative of the manufacturing labour force in Viet Nam as the employee survey is designed as a cross-section. Creating employee-level panel data requires revealing employee names, which cannot be done due to confidentiality concerns.

Questionnaire of the survey can be accessed on the website of UNU Wider.

We measure firm size based on the number of employees and classify firms in three size categories following World Bank suggestions: Micro enterprises are composed of fewer than ten employees, while small-sized firms have between 10 and 49 workers and medium companies from 50 up to 300 employees. Due to our focus on SMEs, we exclude large enterprises with more than 300 workers. In our sample, the average number of workers per firm decreased from 19 in 2005 to 16 in 2015. In 2005, 63 % of the sample's enterprises were micro sized, 29% small and 8% medium sized. These shares changed to 70, 23, and 7% in 2015, respectively.

Table 4.3: Vietnam's non-state and household manufacturing by province in 2005

Province	Household enterprises	Non-state enterprises	Total
Ha Noi	16,588	2,429	10,017
Phu Tho	17,042	127	17,169
Ha Tay*	23,890	201	24,091
Hai Phong	12,811	363	13,174
Nghe An	22,695	237	22,932
Quang Nam	10,059	111	10,620
Khanh Hoa*	5,603	256	5,859
Lam Dong	5,268	160	5,428
HCMC	34,241	3,682	37,923
Long An	8,050	205	8,255
Total	156,697	7,771	164,468

*Source: GSO(2004, 2005)***Table 4.4: Number of interviewed enterprises by year: province and formality status**

	2005		2007		2009		2011		2013		2015	
	F	Inf	F	Inf	F	Inf	F	Inf	F	Inf	F	Inf
Ha Noi	222	75	226	54	236	48	239	36	228	55	275	18
Phu Tho	32	245	49	194	74	185	79	174	76	180	197	55
Ha Tay*	114	281	99	283	106	271	139	206	174	171	305	62
Hai Phong	137	64	121	74	148	62	175	29	156	26	195	23
Nghe An	109	279	99	250	145	209	166	181	162	173	272	66
Quang Nam	81	91	79	76	101	57	107	54	112	55	156	10
Khanh Hoa	98	4	84	2	92	3	96	1	89	1	90	7
Lam Dong	68	21	75	7	57	13	70	11	74	14	86	4
HCMC	652	43	589	20	599	19	566	8	600	12	642	9
Long An	82	47	90	36	100	27	106	18	108	27	122	9
Sample size	1,595	1,151	1,511	996	1,658	894	1,743	718	179,955	714	2,340	263

Source: VEPR (2018)

Table 4.4 breaks these numbers down by legal status. In 2005, the share of firms that were of micro size and informal (36%) was higher than the share of formal micro enterprises (27%). In 2015, many informal firms had formalized such that more micro enterprises were formal (60%) than informal (10%).

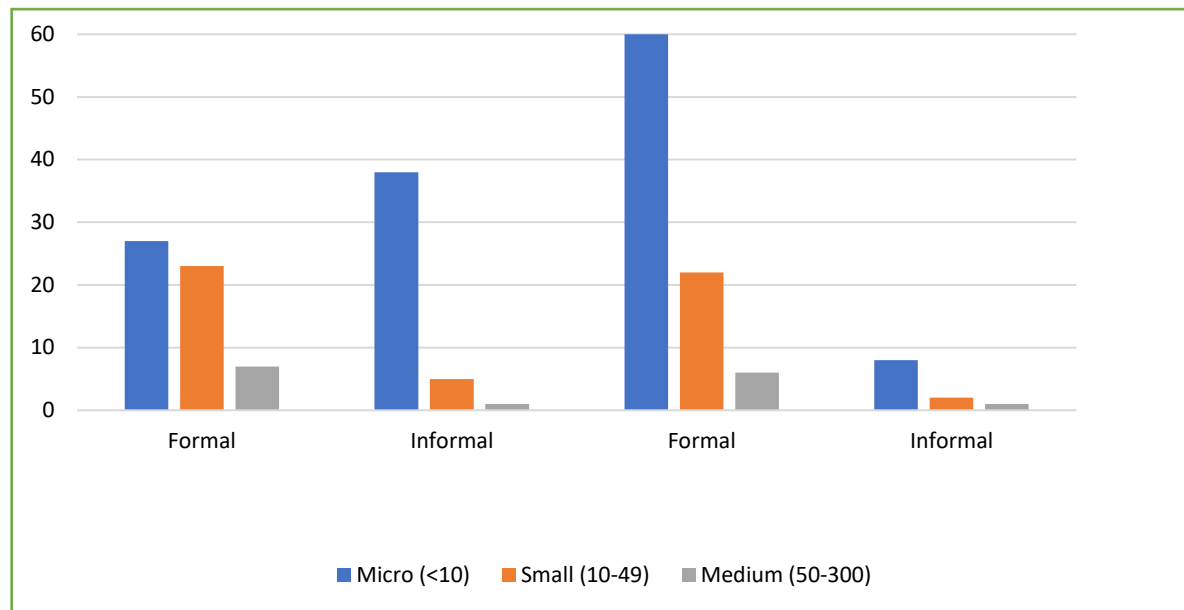


Figure 4.6: SME sample by firm size and formality status

Source: VEPR (2018)

More than half of the sampled firms are household enterprises. This implies that the 2000 Vietnam enterprise law does not recognize them. The share of limited liability companies in the sample increased from 16 to 24 per cent and the percentage of joint stock companies without state capital grew from 2 to 4 per cent during the 2005–15 period. During the same period, sole partnerships decreased from 10 to 6 per cent, while partnerships, collectives and cooperative jointly shrank from 4 to 2 per cent. As can be seen from Figure 4.6, the formality rate increased sharply from 57 per cent in 2005 to almost 90 per cent in 2015; and around 40 per cent of the sample businesses maintained written accounts over the whole period.

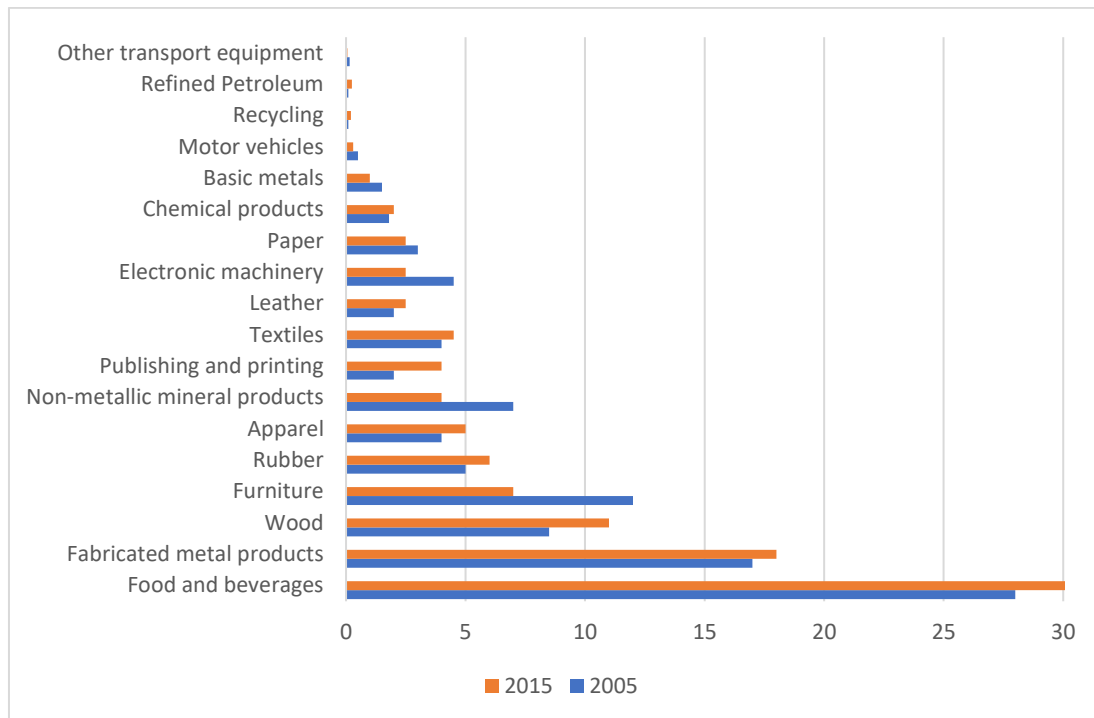


Figure 4.7: SME sample by manufacturing industries

Source: VEPR (2018)

Figure 4.7 illustrates the composition of the sample's manufacturing industries based on standard ISIC-codes in 2005 and 2015, respectively. Food and beverages represent the biggest industry, as 30 per cent of the firms belong to it. Fabricated metal products (17%), wood (11%), furniture (8 %), rubber (5 %), and non-metallic mineral products (5 %) follow suit. Each of the remaining industries includes less than 5 % of the enterprises. The composition of industries has changed over time in that there are relatively more enterprises in the food and beverages, fabricated metal, wood and apparel industries, and fewer in furniture, non-metallic mineral products, textiles, and electronic machinery.

4.3. Research methods:

4.3.1. Access to credit on firm performance

The data on firm performance and credit access is likely to suffer from endogeneity issues because access to credit is an endogenous variable in the output of firms, as argued by Tran and Santarelli (2013). This endogeneity arises because the ability of a firm to access credit is not randomly assigned but is influenced by various factors related to the firm's performance and characteristics. For instance, more

productive or profitable firms are more likely to obtain credit, creating a two-way causality between credit access and firm performance. Consequently, ordinary least squares estimates may be biased and inconsistent due to the correlation between the explanatory variable (credit access) and the error term in the regression model.

To address this endogeneity problem, it is essential to apply a two-stage least squares model, an instrumental variable approach that helps in obtaining consistent and unbiased estimates.

In the first stage, we run the random-effects logit regression to identify determinants of credit access of SMEs. This regression is selected as we explore time-invariant variables in our models, including the gender of the owner, the educational level, and the area where a firm is located (rural provinces or urban cities). This approach ties in an assumption of no correlation between the entity's error term and the independent variables, which allows time-invariant variables to play a role as predictors (Breusch et al., 2011; Tran and Santarelli, 2013). Since access to credit is likely an endogenous variable in the output of firms (Tran and Santarelli, 2013), in the second stage, we employ the method of instrumental variables and two-stage least squares for panel-data models using random-effects estimator to examine whether access to credit has an influence on firm's firm performance. This method is efficient in dealing with the endogeneity issues of credit and measurement error (Baum et al., 2007).

In this study, *distance* and *credit history* are selected as instrumental variables to deal with the endogeneity issues. The former is the distance from the firm to the most important creditor in terms of loan size, while the latter is the credit status if the firm has borrowed from the lenders before. Ellis et al. (2010) show that borrowers far from creditor or bank branches are more likely to be significantly supply-constrained than those close to bank branches. This affects the possibility that borrowers have access to financing. Further, Krasniqi (2010) states that firms with history of borrowing from a bank are more likely to receive credit because of the alleviation of asymmetric information between the lender and the borrower. Hence, we use the distance to creditor, measured by the time and cost to get to the nearest bank branch, and credit history as instrumental variables.

Stage 1: Random-Effects Logit Model

Considering ATC_{it} is access to credit of firm i at time t . This dummy variable takes the value of 1 if a firm obtained either short term or long term formal loan(s) or if

a firm had informal loan(s), and 0 otherwise. We acknowledge that under the value zero, it mixes firms with access to credit and those without. A firm may not have a loan because it does not need it, not because it cannot get it. The zero value might include both firms that applied for a loan and were rejected and those that never applied because they did not need it. Given the data availability, it is not straightforward to disentangle the two types of firms. ATC_{it} is an observed dependent variable and is a function of another variable that is not measured, ATC_{it}^* . This latent variable is used to determine the values of the observed dichotomous dependent variable ATC_{it} .

$$ATC_{it}^* = \beta X_{it} + v_i \quad (1)$$

where: $v_i \sim N(0, \sigma^2)$. ATC_{it}^* is unobserved and called a latent variable, related to the observed dichotomous variable ATC_{it} by:

$$ATC_{it} = \begin{cases} 1, & \text{if } ATC_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

Or:

$$\log \left(\frac{Pr(ATC_{it}=1)}{Pr(ATC_{it}=0)} \right) = \beta X_{it} \quad (3)$$

$$odds_{it} = \frac{ATC_{it}^*}{1-ATC_{it}^*} \quad (4)$$

Stage 2: Instrumental Variable Regression with Random-Effects Estimator

Following Chamberlain and Imbens (2004) and Tran and Santarelli (2013), we use the two-stage least squares random-effects instrumental variable regression in the second stage to examine whether access to credit affects the performance of firms. The model is demonstrated as in Equation (5):

$$FP_{it} = \alpha_0 + \alpha_1 ATC_{it} + \alpha_2 X_{1it} + \alpha_3 Z_{it} + \varepsilon_{it} \quad (5)$$

For random effects: $FP_{it}^* = (LP_{it} - \theta_i \bar{LP}_i) \quad (6)$

$$\varepsilon_{it} = u_i + e_{it} \quad (7)$$

where Z_{it} is a subset of instrumental variables including distance (dis_{it}) and credit history (his_{it}) that

$$ATC_{it} = \delta_0 + \delta_1 dis_{it} + \delta_2 his_{it} + c_{it} \quad (8)$$

IV estimation with two instruments dis_{it} satisfies $E[e_{it}|dis_{it}, c_i] = 0$ and $cov(dis_{it}, c) = 0$, and his_{it} satisfies $E[e_{it}|his_{it}, c_i] = 0$ and $cov(his_{it}, c) = 0$.

Where FP_{it} is the firm performance of firm i at time t , measured by labor productivity, revenue and value added of firm; dis_{it} is the distance to the most important creditor regarding the size of loans of firm i at time t ; his_{it} is the credit history of firm i at time t if it has borrowed from the main creditor; ATC_{it} is access to credit of firm i at time t ; α_1 is the parameter which estimates the effect of credit accessibility on firm's labour productivity; X_{it} in Equations (1) is the vector of variables of firm i at time t , grouped as follows:

- Firm characteristics include firm age, assets (log.), formal registration, investment, network size, distance, credit history.
- Owner characteristics include Party member, owner's age, gender, educational level.
- Business environment characteristics include location (urban or rural), PCI ranking.

X_{1it} in Equations (5) is the vector of variables of firm i at time t is vector of control variables as stated above but has no distance and credit history.

Details of variables used in this study are provided in Table 4.2 – Variables description.

Apparently, with the advantage of time-invariant variables included in the models, the random-effect regressions are used in both stages. The characteristics of firms, owners, and business environment are important in capturing the determinants of firm's accessibility to credit and its influence on firm performance over years.

4.3.2. Innovation on firm performance

Selectivity issues

In this study, the key variable “*innovation*” is measured as a dummy variable taking the value of 1 if a firm had introduced new products, or made improvements of existing products or changed specification, or introduced new production processes or new technology since the last survey, and 0 otherwise. *First*, this variable construction arises a special missing variable issue due to data limitations and questionnaire structure, in which for innovative firms, we have no information on the number of new products, improvements of existing products, and new production processes that a firm had introduced, as well as the shares of successfully improved products/processes or of new products/processes in affecting firm performance.

Second, in a developing country like Vietnam where the financial systems remain underdeveloped, firms are likely to encounter institutional disadvantages, such as the absence of market intermediaries and higher transaction costs (Archer, Sharma, and Su, 2020). Thus, we take into consideration a point that firms' investments in innovation activities derive from their willingness to adopt new technologies to improve their manufacturing processes and enhance their competitiveness, or their reluctance to do so

in order to survive in the markets. The above justifications indicate a possibility of selection biases. Thus, in this study, we adopt the Heckman two-step selection model to first examine the determinants of innovation and second to measure the impact of innovation on firm performance, following previous studies (e.g., Abazi-Alili et al., 2016; Hall, Lotti, and Mairesse, 2009; Klomp and Van Leeuwen, 2001). Abazi-Alili et al. (2016), using panel data sourced from the Business environment and Enterprise Performance Surveys, propose two major models to examine the impact of innovation on firm performance in transition economies. First, the authors apply an innovation probit model with the undertaken innovation activities as a dependent variable. Second, the authors propose a productivity semi-logarithmic model to regress labor productivity on innovation. Given that, in the first step, we estimate which firms had made innovation activities by running a probit regression of innovation on a set of variables. The inverse Mills ratio (or known as selectivity term) is estimated from the first step and used in the second step as the correction for selectivity in the estimation process. This technique allows us to reduce the effects of potential selection biases for estimates of the simultaneous-equation model (Klomp and Van Leeuwen, 2001). Thus, in the second step, we identify the effect of innovation on firm performance with the consideration of the correction for selectivity. This approach allows us to flush out the effect of selection biases of innovation in the first step, then allowing the second step to focus on estimating the impact of innovation on firm performance.

Two-step Heckman models

(i) The first step: Innovation equation

We consider Eq. (1) below:

$$INNO_{it} = \begin{cases} 1, & \text{if } INNO_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

where $INNO_{it}$ denotes innovation, taking the value of 1 if a firm had introduced new products, or made improvements of existing products or changed specification, or introduced new production processes or new technology since the last survey, and 0 otherwise; $INNO_{it}^*$ is the latent variable that represents the unobservable variable of innovation of firm i at time t and defined as follows:

$$INNO_{it}^* = \beta_0 + \beta_1 X_{1it} + v_{1it} \quad (2)$$

where β_0 is the constant term; β_1 captures the effects of the control variables on the dependent variable; X_{1it} is observable time varying and invariant vector of independent variables including liabilities (in logs), firm age, firm size (in logs), investment, competition, machine, gender of owner, and owner's age; location effects and year effects are also included; v_{1it} is the error term, which is a normally distributed disturbance with zero mean u_{it} that $v_{1it} \sim N(0, \sigma_u^2)$.

(ii) The second step: Innovation–firm performance equation

We propose Eq. (3) below:

$$FP_{it} = \omega_0 + \omega_1 INNO_{it} + \omega_2 X_{2it} + v_{2it} \quad (3)$$

Where FP_{it} measures firm performance, proxied by productivity (in logs), revenue from sales (in logs) and value added (in logs); ω_0 is the constant term; ω_1 measures the impact of innovation on firm performance; ω_2 captures the effects of the control variables on the dependent variable; X_{2it} is a list of control variables including liabilities (in logs), firm age, firm size (in logs), investment, outsourcing, network size, gender of owner, and owner's age; location effects and year effects are also included; v_{2it} is the error term and $v_{2it} \sim N(0, \sigma_u^2)$.

As discussed, the impact of innovation on firm performance might encounter a potential issue of selection biases. Thus, estimated results may not be accurate if selection biases are not addressed. To eliminate the selection bias issue and yield accurate results, we adopt the Heckman's selectivity model, considering an assumption under the Heckman's modelling strategy that both error terms v_{1i} and v_{2i} are normally distributed with mean 0. According to the Heckman modelling strategy, we estimate the inverse Mills ratio from the first step and incorporate it in the second step as the correction for selectivity in the estimation procedure. The inverse Mills ratio captures the probability density function over the cumulative distribution function of a distribution. The equation function for FP_{it} in the selected sample is given as follows:

$$E(FP_{it} | INNO_{it} = 1, X_{1it}) = \omega_0 + E(v_{1it} | INNO_{it} = 1, X_{1it}) + \omega_2 X_{2it} \quad (4)$$

Given the assumption above regarding the normal distribution, Eq. (4) can be demonstrated as below:

$$FP_{it} = \omega_0 + \omega_1 \frac{\varphi(INNO_{it})}{\Phi(INNO_{it})} + \omega_2 X_{2it} \quad (5)$$

where $\frac{\varphi(INNO_{it})}{\Phi(INNO_{it})}$ is the inverse Mills ratio; $\varphi(INNO_{it})$ and $\Phi(INNO_{it})$ are the probability and cumulative distribution functions, respectively.

4.3.3. The combination effects of access to credit and innovation to firm performance

We argue there are endogenous issue appeared in the model. Therefore, we apply the two-stage regression method to address the endogeneity problems. In the first stage, we run the random-effects logit regression to identify determinants of credit access of SMEs and innovation. This regression is run with 3 sets of variables: Firm characteristics include firm age, assets (log.), formal registration, investment, network size, distance, credit history., Owner characteristics include Party member, owner's age, gender, educational level, and business environment characteristics include location (urban or rural), PCI ranking. Since access to credit and innovation is likely an endogenous variable in the output of firms, in the second stage, we employ the method of instrumental variables and two-stage least squares for panel-data models using random-effects estimator to examine whether the combination effects of access to credit and innovation on firm's performance. This method is efficient in dealing with the endogeneity issues of credit, innovation and measurement error (Baum et al., 2007).

In this study, *distance*, *credit history*, and *mean of innovation by code of firm* are selected as instrumental variables to deal with the endogeneity issues. These variables are chosen following the research of Ellis et al. (2010) and Krasniqi (2010). Hence, we use the distance to creditor, measured by the time and cost to get to the nearest bank branch, and credit history, and mean of innovation by code of firm as instrumental variables.

Stage 1: Random-Effects Logit Model

We have the variable ATC_{it} is access to credit of firm i at time t . This dummy variable takes the value of 1 if a firm obtained either short term or long term formal loan(s) or if a firm had informal loan(s), and 0 otherwise.

$$ATC_{it} = \begin{cases} 1, & \text{if } ATC_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases}$$

And $INNO_{it}$ denotes innovation, taking the value of 1 if a firm had introduced new products, or made improvements of existing products or changed specification, or

introduced new production processes or new technology since the last survey, and 0 otherwise;

$$INNO_{it} = \begin{cases} 1, & \text{if } INNO_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases}$$

Stage 2: Instrumental Variable Regression with Random-Effects Estimator

We use the two-stage least squares random-effects instrumental variable regression in the second stage to examine whether access to credit and innovation affects the performance of firms. The model is demonstrated as in Equation:

$$FP_{it} = \alpha_0 + \alpha_1 ATC_{it} + \alpha_2 INNO_{it} + \alpha_3 X_{it} + \alpha_4 Z_{it} + \varepsilon_{it}$$

For random effects: $FP_{it}^* = (LP_{it} - \theta_i \overline{LP_i})$

$$\varepsilon_{it} = u_i + e_{it}$$

where Z_{it} is a subset of instrumental variables including distance (dis_{it}) and credit history (his_{it}) and mean of innovation by code ($mean_inno_{it}$)

Where FP_{it} is the firm performance of firm i at time t , measured by labor productivity, revenue and value added of firm; dis_{it} is the distance to the most important creditor regarding the size of loans of firm i at time t ; his_{it} is the credit history of firm i at time t if it has borrowed from the main creditor; ATC_{it} is access to credit of firm i at time t ; α_1 is the parameter which estimates the effect of credit accessibility on firm's performance; α_2 is the parameter which estimates the effect of Innovation on firm's performance, X_{it} is the vector of control variables of firm i at time t ,

Details of variables used in this study are provided in Table 4.2 – Variables description.

Apparently, with the advantage of time-invariant variables included in the models, the random-effect regressions are used in both stages.

CHAPTER 5: RESULTS

5.1. Descriptive statistics

Table 5.1 presents descriptive statistics, including mean, standard deviation, minimum, and maximum values, of variables used in this study. As seen, the average labour productivity in logarithm was 11.39 in the period 2007 – 2015, which equals to 178,494 thousand VND. In the other way, the revenue per employee of a firm was, on average, 178,494 thousand VND or approximately 8,500 USD.

In the sample, the average total annual sales for all products of a firm was approximately 13.3 (in logs). On average, firm's value added, which is estimated by the value of production or manufactured output minus total indirect costs minus value of raw materials used, was 12.2 (in logs). The average firm growth, measured by the difference of logarithm of revenue in year t and logarithm of revenue in year $t-1$, was 9.1%.

SMEs had an average age of 15 years and total assets of 4,090,086 thousand VND or 194,766 USD, while the average age of the owner was 46.5. The PCI of these firms, on average, was 57.06 in the period, suggesting the average PCI index of provinces listed in the Vietnam's SME Survey in measuring the provincial competitiveness as a factor of the economic growth at the local level.

On average, 46.0% of firms had introduced new products, or made improvements of existing products or changed specification, or introduced new production processes or new technology since the previous survey. In more detail, there was 11% of firms, on average, having introduced new products; 41.4% of firms having made improvements of existing products or changed specification; and 15.7% of firms having introduced new production processes or new technology. The average of liability value was approximate 6.1 (in logs). Mean of firm age was 15.2 years and the average size of firm was 1.8 measured by the number of employees (in logs).

In the survey, 54.3% of firms reported to have made investments since the previous survey. On average, 30% of firms faced competition in their field of activity. 63.6% of firms reported using both manually and power-driven machinery in their production activities. On average, only 6.0% of firms outsourced production. In regard to networking, on average, firms had regular contact with approximately 33 people whom firms remained contact at least once every three months for their business operations purposes. On average, 66.9% of firms were owned by male owners. At mean, owner's age was 46.5 years old. In terms of location, 35.9% of surveyed firms are located in urban areas, including Ha Noi, Hai Phong,

Ho Chi Minh City, and the remaining is located in Phu Tho, Ha Tay, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, and Long An.

Table 5.1. Descriptive statistics of variables

Variable	Mean	Std. Dev.	Min.	Max.
Labour productivity (log.)	11.388	1.332	-0.059	18.135
Revenue (log.)	13.328	1.937	0.000	22.836
Value added (log.)	12.151	1.829	0.000	19.539
Growth	0.091	0.686	-17.234	17.479
Access to credit	0.402	0.490	0.000	1.000
Innovation (Yes = 1)	0.460	0.498	0.000	1.000
New products (Yes = 1)	0.110	0.313	0.000	1.000
Improved products (Yes = 1)	0.414	0.493	0.000	1.000
New processes (Yes = 1)	0.157	0.364	0.000	1.000
Liabilities (log.)	6.100	5.869	0.000	19.660
Firm age	15.236	10.123	1.000	75.000
Assets (log.)	13.650	1.824	4.595	19.567
Registration	0.582	0.493	0.000	1.000
Investment	0.543	0.498	0.000	1.000
Competition (Yes = 1)	0.866	0.341	0.000	1.000
Machine (Yes = 1)	0.636	0.481	0.000	1.000
Outsourcing (Yes = 1)	0.060	0.238	0.000	1.000
Network size	32.308	39.875	0.000	978.000
Distance	0.684	0.809	0.000	2.000
Credit history	0.305	0.460	0.000	1.000
Party member	0.095	0.293	0.000	1.000
Owner's age	46.509	10.420	17.000	94.000
Gender (Male = 1)	0.669	0.471	0.000	1.000
Education	0.250	0.433	0.000	1.000
Location (Urban = 1)	0.359	0.480	0.000	1.000
PCI ranking	31.233	15.758	3.000	62.000
Number of observations	6,080			

Table 5.2 shows the differences of labour productivity and firm size by total assets between firms that had access to credit and those that did not. On average, the former has a higher level of labour productivity than does the latter. Although the group of access-to-credit firms is outnumbered by their counterparts in terms of scale, its average labour productivity and total assets are still higher. The average labour productivity of the ATC group was 231,024 thousand VND (11,000 USD) while that of the NATC group was 143,111 thousand VND (6,815 USD). Likewise, firm size measured by total assets of the ATC group, on average, was around 295,543 USD, which is 2.3 times higher than that of their counterparts. In the context of Vietnam, firms with better access to credit appear to have typical characteristics, including a higher level of total assets that derive from their larger economic scale, a higher volume of sales, a wider networking with banking institutions, more fixed assets to use as collaterals, thus they are more likely to secure bank loans than their counterparts (Le, 2012).

Table 5.2. Labour productivity and firm size by access to credit

Variable	Access to credit (ATC)		Non-access to credit (NATC)	
	Mean	Std. Dev.	Mean	Std. Dev.
Labour productivity (thousand VND)	231,024.20	1,569,839	143,111.40	242,097.80
Labour productivity (log.)	11.53	1.30	11.29	1.34
Total assets (thousand VND)	6,206,400	17,500,000	2,664,634	9,030,910
Total assets (log.)	14.07	1.84	13.37	1.76
Number of observations	2,445		3,630	
Percent	40.25		59.75	

Table 5.3 presents t-test statistics regarding the difference of firm performance between innovative and non-innovative firms. Generally, the average revenue (in logs) of innovative firms was 13.7, while that of non-innovative firms was reported at 12.9- this difference is statistically significant at 1% level, suggesting that the average revenue from sales of innovation group is statistically greater than that of non-innovation group.

Similarly, firms having innovation activities performed a higher level of value added than those without having innovation activities, reporting at 12.6 (in logs) as compared to 11.8 (in logs) respectively. This difference is also statistically significant at 1% level. In terms of revenue growth, innovative firms obtained a statistically higher level of growth than their counterparts, significance at 1%.

Table 5.3. The difference of firm performance between innovative and non-innovative firms

	Innovative firms		Non-innovative firms		<i>t</i> -test
	Mean	S.E.	Mean	S.E.	Diff.>0
	[5]		[6]		[5] – [6]
Revenue (log.)	13.747	(0.031)	12.970	(0.036)	15.904***
Value added (log.)	12.568	(0.030)	11.794	(0.034)	16.803***
Growth	0.145	(0.016)	0.045	(0.001)	5.686***
Observations	2,798		3,282		

Descriptive statistics report means of individual variables (Column [1]), followed by standard deviations (Column [2]), minimum (Column [3]), and maximum values (Column [4]). Mean values of firm performances between innovation and non-innovation groups of firms are presented in Columns [5] and [6], respectively. Differences of firm performances as measured by revenue (in logs), value added (in logs), and growth are reported by using *t*-test to test the null hypotheses H0: difference of mean is not greater than 0. *** denotes the levels of significance at 1%.

5.2. Regression results

5.2.1. Impact of access to credit to firm performance

5.2.1.1. The First Stage: Access to Credit

As discussed previously, we apply the random-effects logit model in the first stage to discover the determinants of access to credit of SMEs in Vietnam. The result from running the random-effects logit regression is demonstrated in Table 5.4.

Table 5.4. First stage regression: Determinants of access to credit

Variable	Random-effects logit		Pooled logit		Correlated random-effects logit	
	Coef.	Odd Ratios	Coef.	Odd Ratios	Coef.	Odd Ratios
	[1]	[2]	[3]	[4]	[5]	[6]
Firm age	-0.007 (0.006)	0.993 (0.006)	-0.007 (0.004)	0.993 (0.004)	-0.003 (0.007)	0.997 (0.007)
Assets (log.)	0.195*** (0.035)	1.215*** (0.043)	0.164*** (0.028)	1.178*** (0.033)	0.170*** (0.059)	1.185*** (0.070)
Registration	0.123 (0.116)	1.131 (0.131)	0.077 (0.099)	1.080 (0.107)	0.282* (0.145)	1.325* (0.192)
Investment	1.201*** (0.106)	3.323*** (0.351)	1.094*** (0.088)	2.987*** (0.263)	1.071*** (0.121)	2.917*** (0.353)
Network size	0.001*** (0.0004)	1.001*** (0.0004)	0.001*** (0.0004)	1.001*** (0.0004)	0.002*** (0.001)	1.002*** (0.001)
Distance	2.432*** (0.100)	11.379*** (1.136)	2.173*** (0.080)	8.785*** (0.704)	2.239*** (0.105)	9.384*** (0.984)
Credit history	0.595*** (0.113)	1.813 (0.206)	0.545*** (0.097)	1.725*** (0.168)	0.395*** (0.125)	1.484*** (0.185)
Party member	0.437*** (0.166)	1.549*** (0.257)	0.411*** (0.134)	1.508*** (0.201)	0.440*** (0.167)	1.553*** (0.259)
Owner's age	-0.007 (0.005)	0.993 (0.005)	-0.005 (0.004)	0.995 (0.004)	0.000 (0.008)	1.000 (0.008)
Gender (Male = 1)	-0.150 (0.107)	0.861 (0.092)	-0.127 (0.088)	0.880 (0.077)	-0.310** (0.148)	0.734** (0.108)
Education	0.020 (0.115)	1.020 (0.118)	-0.016 (0.103)	0.985 (0.101)	0.074 (0.139)	1.077 (0.150)
Location (Urban = 1)	-1.098*** (0.145)	0.333*** (0.048)	-0.938*** (0.111)	0.392*** (0.044)	-0.884*** (0.152)	0.413*** (0.063)
PCI ranking	-0.008**	0.992**	-0.007**	0.993**	-0.007*	0.993*

Variable	Random-effects logit		Pooled logit		Correlated random-effects logit	
	Coef.	Odd Ratios	Coef.	Odd Ratios	Coef.	Odd Ratios
	[1]	[2]	[3]	[4]	[5]	[6]
Intercept	(0.003) -4.927***	(0.003) 0.007***	(0.003) -4.259***	(0.003) 0.014***	(0.004) -4.337***	(0.004) 0.013***
Year effects	(0.527) Yes	(0.004) Yes	(0.405) Yes	(0.006) Yes	(0.699) Yes	(0.009) Yes
Mundlak correction	No	No	No	No	Yes	Yes
Observations	6,080	6,080	6,080	6,080	6,080	6,080

This table presents the determinants of credit access. Dependent variable is access to credit. Columns [1], [3], and [5] denote the values of coefficients in random-effects logit, pooled logit and correlated random-effects logit regressions, respectively. *, **, and *** denote significance at the 10%, 5%, and 1% levels, correspondingly. Robust standard errors are in parentheses shown in Columns [2], [4], and [6].

In this stage, we find no significant relationship between the *firm age* and the possibility that firms have access to credit, which is consistent with Rand (2007). It is argued that the older firms have lower demands for credit than the younger ones, explained by the firm life-cycle. At the point that older firms overcome their life-cycle, it would increase their likelihood of self-financing instead of having external credit access. Also, registration under the Law on Enterprises has no significant impact on the probability of firms having credit access. It suggests no significant evidence on access to external capital funding in case that a firm had Business Registration Application – including Business Registration Certificate, Tax Code Registration, and Seal Engraving Permit. This finding is inconsistent with Tran and Santarelli (2013) that firms’ formal registration under the Law enables them to have credit access more easily and then they are less likely to be credit rationed.

Firm size, proxied by the logarithm of total assets, is positively correlated with the likelihood of firms having credit access at the 1 percent significance level. Specifically, bigger firms are 1.2 times more likely to have access to credit than smaller ones, which can be explained by two reasons. First, larger firms have more demand for external financing (Rand, 2007) because they plan investing in many activities to expand their business. When their demand for funds is substantial, they are more likely to seek

external financing and have access to credit. Second, larger firms with high value of assets are more likely to satisfy the collateral requirements of the lenders (Buyinza and Bbaale, 2013). Hence, their applications for loans are preferably approved regardless of the financing sources. The positive effect of firm size on firm's credit access is consistent with earlier studies by Le (2012) and Cao (2014).

At the 1 percent level of significance, firms making investment are 3.3 times more likely to have credit access than those which did not. These firms often have more demand for capital to invest in both short-term and long-term activities. According to Aghion et al. (2010), short-term loans are mobilised for investments in working capital, input purchase, or wage costs while long-term loans are required for land, buildings, equipment or machinery, and research and development. Firms which have made any investment often have sufficient assets to become collaterals, hence have a better access to finance.

Network size has a positive impact on the possibility that a firm has access to credit at the 1 percent significance level, which is consistent with Nguyen and Luu (2013). Accordingly, firms which are members of business associations are more likely to have loan applications approved, suggesting that more networking increases the ability of firms to approach credit. Networking helps firms improve their relationships with other firm members and with banks or lenders, hence reducing financial obstacles of firms when having access to credit (Tran and Santarelli, 2013). Likewise, we find that distance has a statistically positive relationship with firm's credit access, suggesting that firms are more likely to have credit access from far lenders. This is inconsistent with Ellis et al. (2010) that factors from supply side such as far distance to banks may preclude firms from having credit access. In the context of Vietnam, creditors, particularly commercial banks, normally set up their transaction offices in the commune- or district-level administrative units, providing several primary services such as savings, withdrawal, and opening accounts. If firms intend to borrow credit, they often go to bank branches or bank's headquarters, which are normally located in centred areas and may be far from enterprises. Bank branches or headquarters are functional to lend firms, then firms may obtain sufficient amount at the requested time.

Credit history of firms significantly positively affects the probability that firms have credit access. Firms with previous loan payments history appear to establish and maintain their creditworthiness with the lenders, which alleviates the asymmetric information and makes those firms more likely to receive loans (Krasniqi, 2010). Thus,

firms having credit history with the lenders are more likely to receive credit than their counterparts, as highlighted by Nguyen and Luu (2013).

With regard to the owner characteristics, firms whose owner is a member of the Communist Party are more likely to have credit access. Notably, the odd ratio of this variable is 1.55, which suggests that Party-member owners have a higher probability of having access to credit than non-Party members by 1.55 times. This finding is inconsistent with Nguyen and Luu (2013) who find no significant evidence on the relationship between the Communist Party owner of a firm and the likelihood that the firm has credit access. Besides, we find no significant effect of age of owner, gender and educational level of the owner on firm's accessibility to capital.

In terms of Business environment characteristics, it is indicated that location and PCI ranking negatively affect credit accessibility of firms. Accordingly, firms located in urban cities are 0.33-times less likely to have access to capital than those located in rural provinces. Rand (2007) indicates that many rural household firms have the necessary certificate of land use right and use it as collateral when applying for loans. However, "the situation in urban areas is more complex, and the possibilities to use land-holding rights as collateral are more limited" (Rand 2007, p.3). The shortage of collateral is one of the biggest obstacles which affect the access to finance of firms (Le, 2012). Regarding *PCI ranking*, the result shows a negative relationship between the ranking and the access to credit, suggesting that those located in provinces with a higher ranking or better PCI are less likely to have credit access. This finding is in line with Cao (2014) that a favourable business environment helps SMEs reduce their dependence on external credit. However, Le (2012) finds no statistical impact of PCI on the probability of SME business having access to credit.

5.2.1.2. The Second Stage: Access to Credit and Firm performance

The instrumental variable regression for panel data using random-effects estimator is applied in the second stage to analyse how access to credit affects firm performance of firms. Evidence from literature also shows that borrowers far from creditor or bank branches are more likely to be significantly supply-constrained than those close to bank branches (Ellis et al., 2010). This affects the possibility that borrowers have access to financing. Regarding credit history, Krasniqi (2010) shows that firms with history of borrowing from a bank appear to receive credit because of the alleviation of asymmetric information between the lender and the borrower. Thus, we follow literature to use the distance to creditor and credit history as instruments to

address endogeneity. Tests for endogeneity issues are presented in Table 5.5 and results of IV regressions are shown in Table 5.6.

Result from Durbin-Wu-Hausman test for endogeneity of regressors produces the χ^2 statistic of 5.551 with P-value of 0.018, as shown in Tabel 5.5, which is less than 0.05, thus we reject the null hypothesis that the regressor is not endogenous. In fact, our key independent variable (*access to credit*) is endogenous, thus the endogeneity issue needs to be addressed.

We demonstrate Sanderson-Windmeijer test of excluded instruments to test for the significance of excluded instruments, χ^2 statistics is smaller than 0.05, suggesting that we reject the null hypothesis that the instruments are bias estimators (Sanderson and Windmeijer, 2016). This confirms the significance of our instruments in the regressions.

We perform Kleibergen-Paap LM test for under-identification to test the null hypothesis that the instruments have insufficient explanatory power to predict the endogenous variable(s) in the model for identification of the parameters. As shown in Table 5.5, a small value of p-value statistics (< 0.05) indicates a rejection of the null indicates and confirms that the model parameters are identified.

Last, we show Hansen-J test for overidentification of all instruments to test whether the instruments are valid, for example, uncorrelated with the error term, and whether the excluded instruments are correctly excluded from the estimated equation. As p-value is greater than 0.10, we cannot reject the null hypothesis, which suggests that our instruments are valid and that are correctly excluded from the estimated equation.

Table 5.5. Testing for endogeneity

	$\chi^2(1)$	P-value
	[1]	[2]
Durbin-Wu-Hausman test for endogeneity of regressors	5.551**	[0.018]
Sanderson-Windmeijer test of excluded instruments	840.390***	[0.000]
Kleibergen-Paap rk LM test for underidentification	559.350***	[0.000]
Hansen-J test for overidentification of all instruments	0.572	[0.449]

This table presents the test for endogeneity. Dependent variable is labour productivity. Columns [1] and [2] denote χ^2 and P-value, respectively. *, **, and *** denote significance at the 10%, 5%, and 1% levels, correspondingly. P-value is shown in brackets.

Table 5.6 demonstrates the significant effect of access to credit on firm-level labour productivity. As demonstrated, credit access positively affects a firm's labour

productivity at the 1 percent significance level, suggesting that the level of labour productivity of firms with access to credit is 24.7 percent higher than that of their counterparts. Access-to-credit firms would be more likely to improve their financial capability to engage in other activities and expand their business. Besides, credit access enables firms to purchase and apply modern technology in production or to invest in new profitable projects, which is an efficient way to increase the labour productivity. Our finding is consistent with Akoten et al. (2006) and Giang et al. (2019) regarding the positive relationship between access to finance and productivity. Firms with better credit access are more likely to perform better (Akoten et al., 2006). The result is also consistent with Buyinza and Bbaale (2013) that the performance of firms benefits from their credit access. Apparently, the causal impact of access to capital on productivity re-affirms the importance of finance in economic growth.

Table 5.6. Second stage IV regression: Access to credit and labour productivity

Variable	Random-effects IV		Fixed-effects IV		Pooled OLS IV	
	[1]	[2]	[3]	[4]	[5]	[6]
Access to credit	0.247***	(0.058)	0.241***	(0.066)	0.242***	(0.054)
Firm age	-0.007***	(0.002)	0.001	(0.002)	-0.010***	(0.002)
Assets (log.)	0.165***	(0.012)	0.142***	(0.030)	0.169***	(0.014)
Registration	0.106**	(0.041)	0.041	(0.037)	0.118***	(0.041)
Investment	-0.042	(0.039)	-0.028	(0.039)	-0.056	(0.038)
Network size	0.0004**	(0.000)	0.0002	(0.000)	0.001**	(0.000)
Party member	-0.025	(0.058)	0.006	(0.069)	-0.037	(0.053)
Owner's age	-0.006***	(0.002)	-0.006**	(0.003)	-0.005***	(0.002)
Gender (Male = 1)	0.074**	(0.036)	-0.026	(0.054)	0.111***	(0.034)
Education	0.082**	(0.039)	0.082	(0.051)	0.072*	(0.038)
Location (Urban = 1)	0.278***	(0.049)			0.248***	(0.043)
PCI ranking	0.001	(0.001)	0.003**	(0.001)	0.0003	(0.001)
Intercept	8.744***	(0.175)			8.702	(0.177)
Year effects	Yes		Yes		Yes	
R-squared	0.130		0.134		0.198	
Number of observations	6,080		6,080		6,080	

This table presents the impact of access to credit on labour productivity. Dependent variable is labour productivity. Columns [1], [3], and [5] denote the values of coefficients in random-effects IV, fixed-effects IV and pooled OLS IV regressions, respectively. *, **, and *** denote significance at the 10%, 5%, and 1% levels, correspondingly. Robust standard errors are in parentheses shown in Columns [2], [4], and [6].

Result from the *t-test* shown in Table 5.7 supports the finding that firms with access to credit have a higher level of labour productivity than their peers. At the 1 percent significance level, the t-test result indicates the negative difference between mean logarithm of labour productivity of non-credit access firms and that of credit access ones.

Table 5.7. Difference of labour productivity by access to credit

	Non-access to credit	Access to credit	t-stat.
Observations	3,630	2,445	
Mean	11.2909	11.5334	-6.9861***
Standard Error	0.0223	0.0263	
Standard Deviation	1.3439	1.3003	

This table presents the difference of labour productivity by access to credit. Dependent variable is labour productivity. *** denotes significance at the 1% level. The main hypothesis is the difference between mean logarithm of labour productivity of non-credit access firms and that of credit access ones. The t-test hypothesis is H_0 : difference = 0, and H_a : difference < 0.

Table 5.8. Access to credit and revenue and value added

Variable	Dependent variable: Revenue (log.)			Dependent variable: Value added (log.)		
	Coef.	SE	z-stas	Coef.	SE	z-stas
Access to credit	0.524***	(0.068)	7.67	0.428***	(0.062)	6.93
Firm age				-		
	-0.008***	(0.002)	-3.69	0.008***	(0.002)	-4.19
Assets (log.)	0.470***	(0.015)	32.16	0.457***	(0.013)	34.52
Registration	0.396***	(0.048)	8.20	0.378***	(0.043)	8.68
Investment	0.107**	(0.045)	2.36	0.127***	(0.041)	3.10
Network size	0.002***	(0.000)	5.04	0.001***	(0.000)	3.85
Party member	0.075	(0.035)	4.17	0.069	(0.027)	3.18
Owner's age				-		
	-0.009***	(0.002)	-4.26	0.010***	(0.002)	-5.19
Gender (Male = 1)	0.071*	(0.043)	1.68	0.103***	(0.038)	2.67
Education	0.319***	(0.046)	6.93	0.322***	(0.042)	7.74
Location (Urban = 1)	0.446***	(0.059)	7.54	0.493***	(0.053)	9.15
PCI ranking	0.004***	(0.001)	2.68	0.002*	(0.001)	1.87
Intercept	6.383***	(0.211)	30.28	5.489***	(0.191)	28.72
Year effects	Yes			Yes		
R-squared	0.405			0.516		
Number of observations	6,080			6,080		

This table presents the impact of access to credit on revenue and value added. Dependent variables are revenue and value added. *, **, *** denote significant at the 10%, 5% and 1% levels, correspondingly.

Table 5.8 confirms the significant effect of access to credit on firm performance, measured by revenue (in logs.) and value added (in logs). As demonstrated, credit access positively affects a firm's revenue and value added at the 1 percent significance level, suggesting that the level of revenue of firms with access to credit is 52.4 percent higher than that of their counterparts and value added of firms increased 42.8 percent if they have access to credit. Our finding is consistent with Akoten et al. (2006) and Giang et al. (2019). They also find that firms with better credit access are more likely to perform better. This results also confirm the causal impact of access to capital on firm performance.

From table 5.6 and 5.8, the effects of *firm age* and *owner's age* are both interestingly negative, suggesting that younger firms and younger owners have better performance. This finding is consistent with Tran and Santarelli (2013) who find that aging has a negative relationship with firm performance, or that it has less valuable contributions for the performance of firms, because older owners or older firms prefer to be settled down rather than investing in new venture projects to make revenue. Regarding *firm size*, it has a positive impact on labour productivity at the 1 percent significance level, implying that a 1 percent increase of assets' value leads to 16.5 percent increase of labour productivity. When a firm invests in asset, for example in research and development activities, it can facilitate staff members increasing knowledge and skills or upgrade and replace new technologies, which in turn results in higher productivity—consistent with Tran and Santarelli (2013).

Formal registration and *network size* of firms are positively correlated with the firm performance, while *investment* is found to have no significant impact on firm performance. At the 5 percent level of significance, registered firms under the Law on Enterprises have a higher level of productivity than unregistered ones by 10.6 percent. This finding is consistent with Fajnzylber et al. (2011) that newly created firms under the formality status have higher levels of revenue and profits, hire more employees, and are more capital intensive. Further, the official registration enables firms to issue VAT invoices, which leads to the increase of customer demand. Thus, registered firms are more likely to have better revenue than their counterparts and better labour productivity as a result. The positive relationship between formal registration of firms and their performance is also affirmed by Tran and Santarelli (2013). Network size positively affects firm performance but in a very small level. The participation of firms in professional associations helps them increase firm performance indicators, which is

consistent with Nguyen and Luu (2013) that business networking proves its efficiency in boosting firm growth.

Gender and *educational level* of the owner are found to have a positive association with firm performance. Accordingly, male-owned firms have a higher level of productivity than female-owned ones by 7.4 percent. Male owners often have more work experience and are willing to invest in venture business alternatives to make revenue (Fairlie and Robb, 2009). Work experience of male owners and their willingness to take risks make their firm revenue better, resulting in better productivity. Besides, firms whose owner completed an undergraduate or a postgraduate program are performed a higher level of labour productivity by 8.2 percent than those whose owner had no professional education, or graduated from a vocational college or a technical secondary school. It can be explained that the owner's qualifications might help firms improve their business strategies and orientations. Therefore, these enterprises are more likely to have better structural and financial management, which likely increases their revenue and firm performance. In the context of Vietnam, highly educated owners are active to seek investments, expand networking, and engage in activities which may bring benefits for their firms in the long run. This finding is consistent with Akoten et al. (2006) and Tran and Santarelli (2013).

With regard to the business environment characteristics, no significant relationship between *PCI ranking* and firm performance is found, which is consistent with Le (2012). However, at the 1 percent level of significance, *location* has a positive association with the firm performance. Firms located in urban areas have a higher level of labour productivity by 27.8 percent than firms in rural areas. The reasons come from the characteristics of firms located in urban and rural areas. Accordingly, enterprises located in urban areas – with bigger markets, high population and business density, high quality of Internet access, and close distance to big or international markets (Smallbone et al., 2003) – are advantageous in supplying their products and services compared to firms in rural areas. Hence, their revenue is likely to be higher than that of rural firms. Furthermore, location in urban cities increases firm's probability to be equipped with modern technology, which may positively affect their productivity in manufacturing. Therefore, urban firms have a higher level of labour productivity than their counterparts.

We also provide further empirical evidence by considering industry-level competition and firm growth as a proxy to capture overall economic activity, presented in Table 5.9. In Panel A, we take into account firm's competition at the industry level based upon their main area of business and production activity. In Panel B, we use firm

growth to capture economic activity, in which firm growth is estimated as the difference between the logarithm of growth in year t and that in year $t-1$. Results in both panels A and B show that with the consideration of industry-level competition and firm growth, respectively, our variable of interest – instrumented access to credit – has a positive impact on labour productivity at the 1 percent significance level. In particular, results show that firms having access to credit have a higher level of labour productivity by 6 percent than their counterparts. Further, in Panel A, industry-level competition has a positive effect on labour productivity, suggesting that firms facing competition have a higher productivity than those who do not. This finding is consistent with previous studies that competition motivates firms in the production of additional innovation products (Shi, Li and Nomaler, 2020), which leads to an increase of labour productivity (Woltjer, Van Galen and Logatcheva, 2021). In Panel B, we find a positive relationship between growth and labour productivity, suggesting that firms with a higher growth rate have a higher level of labour productivity than their peers. Our finding is consistent with Choi and Choi (2017) who show that firms with high growing rates tend to be more productive as a result of higher capital intensity and more skilled workers.

Table 5.9. Further empirical results on access to credit and firm performance

Variable	Random-effects IV		Fixed-effects IV		Pooled OLS IV	
	[1]	[2]	[3]	[4]	[5]	[6]
<i>Panel A: Competition</i>						
Access to credit	0.064***	(0.015)	0.059***	(0.017)	0.065***	(0.015)
Firm age	-0.007***	(0.002)	0.001	(0.002)	-0.010***	(0.002)
Assets (log.)	0.154***	(0.013)	0.139***	(0.018)	0.157***	(0.012)
Registration	0.085**	(0.041)	0.042	(0.050)	0.090**	(0.040)
Investment	-0.059	(0.040)	-0.041	(0.043)	-0.076*	(0.041)
Network size	0.000**	(0.000)	0.000	(0.000)	0.001***	(0.000)
Industry-level competition	0.517***	(0.139)	-1.176	(4.593)	0.492***	(0.110)
Party member	-0.012	(0.058)	0.011**	(0.073)	-0.022	(0.054)
Owner's age	-0.006***	(0.002)	-0.006	(0.003)	-0.005***	(0.002)
Gender (Male = 1)	0.070*	(0.036)	-0.029*	(0.048)	0.107***	(0.033)
Education	0.080**	(0.039)	0.081	(0.045)	0.069*	(0.039)
Location (Urban = 1)	0.282***	(0.050)			0.259***	(0.041)
PCI ranking	0.001	(0.001)	0.003**	(0.002)	0.000	(0.001)

Variable	Random-effects IV		Fixed-effects IV		Pooled OLS IV	
	[1]	[2]	[3]	[4]	[5]	[6]
Intercept	8.559***	(0.204)	10.214**	(3.982)	8.551***	(0.180)
Year effects	Yes		Yes		Yes	
R-squared	0.201		0.123		0.202	
<i>Panel B: Firm growth</i>						
Access to credit	0.064***	(0.015)	0.059***	(0.017)	0.065***	(0.015)
Firm age	-0.007***	(0.002)	0.001	(0.002)	-0.010***	(0.002)
Assets (log.)	0.161***	(0.012)	0.138***	(0.018)	0.166***	(0.011)
Registration	0.104**	(0.041)	0.040	(0.050)	0.115***	(0.040)
Investment	-0.055	(0.040)	-0.042	(0.043)	-0.069*	(0.041)
Network size	0.000**	(0.000)	0.000	(0.000)	0.001***	(0.000)
Firm growth	0.268***	(0.046)	0.238***	(0.049)	0.291***	(0.048)
Party member	-0.015	(0.058)	0.014	(0.073)	-0.026	(0.054)
Owner's age	-0.006***	(0.002)	-0.006**	(0.003)	-0.005***	(0.002)
Gender (Male = 1)	0.076**	(0.036)	-0.029	(0.048)	0.115***	(0.033)
Education	0.079**	(0.039)	0.081*	(0.045)	0.066*	(0.039)
Location (Urban = 1)	0.288***	(0.050)			0.260***	(0.041)
PCI ranking	0.001	(0.001)	0.004**	(0.002)	0.000	(0.001)
Intercept	8.879***	(0.181)	9.191***	(0.269)	8.830***	(0.165)
Year effects	Yes		Yes		Yes	
R-squared	0.203		0.172		0.204	

This table presents the impact of access to credit on labour productivity. Dependent variable is labour productivity. Columns [1], [3], and [5] denote the values of coefficients in random-effects IV, fixed-effects IV and pooled OLS IV regressions, respectively. *, **, and *** denote significance at the 10%, 5%, and 1% levels, correspondingly. Robust standard errors are in parentheses shown in Columns [2], [4], and [6]. Number of observations is 6,080.

In terms of formal access, we also find the positive relationship between access to formal credit and firm performance, measured by labor productivity, revenue and value added. As show in the table 5.10, the level of labor productivity increases 29.7 percent for firms with access to formal credit. The revenue of firms with access to formal credit is 63.3 percent and 51.4 percent higher than their counterparts, respectively. These results are statistically significant at 1 percent level.

Table 5.10: Access to formal credit and firm performance

Variable	Labor productivity		Revenue		Value added	
	[1]	[2]	[3]	[4]	[5]	[6]
Access to formal credit	0.297***	(0.070)	0.633***	(0.083)	0.514***	(0.075)
Firm age	-0.007***	(0.002)	-0.008***	(0.002)	-0.008***	(0.002)
Assets (log.)	0.160***	(0.013)	0.463***	(0.014)	0.451***	(0.013)
Registration	0.099**	(0.041)	0.386***	(0.049)	0.370***	(0.044)
Investment	-0.043	(0.039)	0.111**	(0.045)	0.130***	(0.041)
Network size	0.001***	(0.000)	0.002***	(0.000)	0.001***	(0.000)
Party member	-0.024	(0.057)	-0.025	(0.061)	-0.026	(0.063)
Owner's age	-0.006***	(0.002)	-0.009***	(0.002)	-0.010***	(0.002)
Gender (Male = 1)	0.073**	(0.036)	0.075*	(0.043)	0.106***	(0.039)
Education	0.073*	(0.039)	0.312***	(0.046)	0.315***	(0.042)
Location (Urban = 1)	0.299***	(0.050)	0.491***	(0.061)	0.531***	(0.055)
PCI ranking	0.001	(0.001)	0.004***	(0.001)	0.002*	(0.001)
Intercept	8.986***	(0.178)	6.469***	(0.212)	5.562***	(0.192)
Year effects	Yes		Yes		Yes	
R-squared	0.195		0.469		0.5146	
Number of observations	6,080		6,080		6,080	

This table presents the impact of access to formal credit on firm performance. Dependent variables are labour productivity, revenue and value added, respectively. Columns [1], [3], and [5] denote the values of coefficients of independent variables. *, **, and *** denote significance at the 10%, 5%, and 1% levels, correspondingly. Robust standard errors are in parentheses shown in Columns [2], [4], and [6].

In terms of informal access, we also find the positive relationship between access to informal credit and firm performance. As demonstrated in table 5.11, the level of labor productivity increases 76.5 percent for firms with access to informal credit. The revenue of firms with access to informal credit is 165.8 percent and 138.9 percent higher than their counterparts, respectively. These results are statistically significant at 1 percent level.

Table 5.11: Access to informal credit and firm performance

Variable	Labor productivity		Revenue		Value added	
	[1]	[2]	[3]	[4]	[5]	[6]
Access to informal credit	0.765***	(0.196)	1.658***	(0.240)	1.389***	(0.216)
Firm age	-0.007***	(0.002)	-0.008***	(0.002)	-0.008***	(0.002)
Assets (log.)	0.168***	(0.012)	0.474***	(0.016)	0.463***	(0.014)
Registration	0.120***	(0.042)	0.425***	(0.052)	0.406***	(0.046)
Investment	-0.041	(0.040)	0.104**	(0.049)	0.121***	(0.044)
Network size	0.000**	(0.000)	0.001***	(0.000)	0.001**	(0.000)
Party member	-0.024	(0.053)	-0.021	(0.051)	-0.020	(0.048)
Owner's age	-0.007***	(0.002)	-0.009***	(0.002)	-0.010***	(0.002)
Gender (Male = 1)	0.067*	(0.037)	0.066	(0.046)	0.100**	(0.041)
Education	0.090**	(0.040)	0.342***	(0.049)	0.342***	(0.044)
Location (Urban = 1)	0.227***	(0.051)	0.349***	(0.064)	0.406***	(0.057)
PCI ranking	0.002	(0.001)	0.005***	(0.002)	0.003*	(0.001)
Intercept	8.886	(0.183)	6.339***	(0.228)	5.412	(0.204)
Year effects	Yes		Yes		Yes	
R-squared	0.168		0.403		0.456	
Number of observations	6,080		6,080		6,080	

This table presents the impact of access to informal credit on firm performance. Dependent variables are labour productivity, revenue and value added, respectively. Columns [1], [3], and [5] denote the values of coefficients of independent variables. *, **, and *** denote significance at the 10%, 5%, and 1% levels, correspondingly. Robust standard errors are in parentheses shown in Columns [2], [4], and [6].

5.2.2. Impact of innovation to firm performance

Factors affecting firm's innovation

Table 5.12 presents results from running the random-effects probit regression to determine the factors that affect a firm's innovation. Our results show a positive coefficient of *liabilities* (*coef.* = 0.004) with the level of significance at 1%, implying that firms having a higher level of liabilities tend to more engage in innovation activities. This is also highlighted in a study by Efthyvoulou and Vahter (2016) who find that financial constraints strongly and negatively prevent firms from a firm's innovative endeavours. As such, firms with better access to credit are more likely to perform their innovation activities than those without credit access.

In regard to firm age, we find a negative relationship between *firm age* and innovation at the significance level of 1% (*coef.* = -0.002). Holding other things unchanged, old firms are less likely to undertake innovation activities than their counterparts by 0.2%. Our finding is in line with results in previous studies (Ayyagari, Demirgüç-Kunt, and Maksimovic, 2011; Gorodnichenko and Schnitzer, 2013) highlighting that young firms tend to present the highest propensity of undertaking innovation activities while old firms are less likely to adopt new technologies.

As seen, the coefficient of *firm size* is positive (*coef.* = 0.085) and significant at 1% level, suggesting that larger-sized firms are more likely to engage in innovation activities than smaller ones by 8.5%, holding other factors fixed. Our finding is consistent with a study by Gorodnichenko and Schnitzer (2013) who find a positive association between the size of firms and the propensity of firms to innovate. As well, results show a positive and significant coefficient of *investment* (*coef.* = 0.130, *sig.* = 1%), suggesting that when holding other things unchanged, firms making investment are more likely to engage in innovation activities than those without investments by 13%. This finding is similar to the finding by Archer, Sharma, and Su (2020) in regard to a positive and significant nexus between investment and innovation, confirming the importance of investment in a firm's innovation propensity.

Likewise, we find a significantly positive relationship between *competition* and innovation (*coef.* = 0.097) at the significance level of 1%, which is emphasised in literature (Ayyagari, Demirgüç-Kunt, and Maksimovic, 2011; Gorodnichenko and Schnitzer, 2013). Our finding suggests that those facing competition from others tend to be more innovative than their peers by 9.7%, holding other factors fixed.

Results show that the coefficient of *machine* is positive (*coef.* = 0.040) and significance at 1% level, which implies that firms used both manually and power-driven machinery are more likely to undertake innovation activities by 4% than their counterparts when keeping other factors unchanged. This finding is in line with Karlsson and Tavassoli (2015) who find that innovations are strongly positively influenced by machinery investments.

Regarding the owner's characteristics, *male-owned firms* tend to be more innovative than female-owned firms by 6.7%, shown through the positive and significant coefficient (*coef.* = 0.067, *sig.* = 1%). *Owner's age* has the inverse impact on innovation as seen by its negative and significant coefficient (*coef.* = -0.002) at the 1% significance level, suggesting that the older the entrepreneurs, the less innovative their owned firms. Our findings that innovation is positively affected by owner's gender

and negatively impacted by owner's age are consistent with literature (Archer, Sharma, and Su, 2020; Foss, Woll, and Moilanen, 2013).

Table 5.12. Factors affecting firm's innovation

Dependent variable: Innovation	Marginal effects	S.E.
	[1]	[2]
Liabilities (log.)	0.004***	(0.001)
Firm age	-0.002***	(0.001)
Firm size (log.)	0.085***	(0.007)
Investment (Yes = 1)	0.130***	(0.013)
Competition (Yes = 1)	0.097***	(0.018)
Machine (Yes = 1)	0.040***	(0.013)
Gender (Male = 1)	0.067***	(0.014)
Owner's age	-0.002**	(0.001)
Location effects	Yes	
Year effects	Yes	

Dependent variable is innovation, which is a dummy variable taking the value of 1 if a firm had introduced new products, or made major improvements to existing products, or introduced new manufacturing processes, and 0 otherwise. Values of marginal effects of individual variables are reported in Column [1] from regressing a random-effects probit model. Standard errors are reported in parentheses (Column [2]). *, **, and *** denote the levels of significance at 10%, 5%, and 1%, respectively. Base: non-innovative firms. A constant term is included. Number of observations is 6,080.

Innovation and firm performance relationship

We present results from Hausman test to select fixed-effects or random-effects regressions with the null hypothesis (H_0) that random-effects model is appropriate and the alternative hypothesis (H_a) that fixed-effects model is appropriate. We perform Hausman tests where dependent variables are revenue (log.) and value added (log.) as demonstrated in Panels A and B, respectively. In Panel A, results in four regressions [1], [2], [3], and [4] where key independent variables are innovation, new products, improvements of existing products, and new processes, respectively, show P-values < 0.01, suggesting that we reject the null hypothesis of a random-effect regression being selected. In other words, fixed-effects regression is appropriate and should be selected to present main results.

Similarly, Panel B shows results in four regressions [5], [6], [7], and [8] with similar settings of key independent variables, including innovation, new products, improvements of existing products, and new processes. Results show that P-values < 0.01, suggesting that we reject the null hypothesis of a random-effect regression and select fixed-effects regression. Main findings are presented in Table 5.13.

Table 5.13. Hausman test of model selection: Fixed-effects or Random-effects

	Innovation	New products	Improvements of existing products	New processes
	[1]	[2]	[3]	[4]
[Panel A] Dependent variable: Revenue (log.)				
χ^2	151.00	157.03	153.13	149.36
P-value	[0.000]	[0.000]	[0.000]	[0.000]
	Reject H ₀	Reject H ₀	Reject H ₀	Reject H ₀
	[5]	[6]	[7]	[8]
[Panel B] Dependent variable: Value added (log.)				
χ^2	120.33	120.51	119.47	119.92
P-value	[0.000]	[0.000]	[0.000]	[0.000]
	Reject H ₀	Reject H ₀	Reject H ₀	Reject H ₀

Dependent variables are firm's revenue (Panel A) and value added (Panel B). Key independent variables are innovation (specifications [1] and [5]), new products (specifications [2] and [6]), improvements of existing products (specifications [3] and [7]), and new processes (specifications [4] and [8]). χ^2 values are reported. P-values are in parentheses. Hausman test is performed to test the null hypothesis (H₀): random-effects model is appropriate; and the alternative hypothesis (H_a): fixed-effects model is appropriate. Number of observations is 6,080.

Tables 5.14, 5.15 and 5.16 show empirical results of the impact of innovation on firm performance, measured by labor productivity (Table 5.14), revenue (Table 5.15) and value added (Table 5.16). As demonstrated, the coefficient of innovation is positive and significant in relation with revenue (column [1]), suggesting that firms engaging in innovation activities have a better performance than those without innovation. Holding other things unchanged, innovative firms perform a higher level of revenue by 15.6% than their counterparts. In column [2], we show a positive impact of innovation through

launching new products on firm performance, yet the coefficient remains insignificant. Column [3] demonstrates a positive and significant connection between innovation through making improvements of existing products on revenue. Holding other factors unchanged, we show that firms making improvements of existing products perform a higher level of revenue than their peers by 13.6%. In column [4], the coefficient of innovation through launching new production processes is positive and significant, showing that innovative firms through introducing new processes have a higher level of revenue by 13.9% than their non-innovative counterparts.

Our findings are consistent with previous studies on the innovation vis-à-vis firm performance relationship. For example, Tuan et al. (2016) find that in the case of Vietnamese firms, process and marketing innovation positively and significantly affects firm performance, while product innovation has no significant impact on firm performance. This suggests that Vietnamese firms prioritise engaging in process and marketing innovation activities rather than investing in product innovation. As highlighted in Archer, Sharma, and Su (2020), firm's innovation in developing countries experience the uncertainty in innovation due to institutional disadvantages. An important difference of firms operated in developing countries as compared to those in developed countries is that while the latter are more likely to launch new products and/or new processes, the former tend to make improvements of existing products and/or processes rather than launching something new to the markets. The reason derives from the fact that firms in developing countries are far from the technology frontier and fail to adopt best practices, making them less likely to introduce new products to the markets (Ayyagari, Demirgüç-Kunt, and Maksimovic 2011; Madrid-Guijarro, Garcia, and Van Auken, 2009). It can also be explained that manufacturing SMEs in developing countries somehow manufacture products based on pre-orders of specific products from their business partners who might already have customised product designs and requirements (Tuan et al., 2016). Thus, these firms appear not to have the opportunity to invest in producing new products and introduce them to the markets. Rather than that, they stayed focused on improving existing products and/or launching production processes to improve the efficiency and productivity, resulting in an increase of firm performance.

We also find some significant relationships between control variables and firm's revenue as shown in all columns from [1] to [4]. The coefficient of *liabilities (in logs)* is positive and significant, which suggests that firms having access to credit are more

likely to have a higher level of revenue, as shown in all four specifications. This finding is consistent with Buyinza and Bbaale (2013) who find that credit access statistically significantly increases firm performance.

In terms of *firm age*, we find no significant association between firm age and revenue. Regarding *firm size*, we find a significant and positive coefficient (*coef.* = 0.62) in all four specifications, suggesting that larger firms—those with a higher number of total employees, perform better. Our finding is in line with a study by Kuncová, Hedija, and Fiala (2016) that firm size has a positive impact on firm performance: larger firms achieve a higher economic performance as compared to their smaller peers.

The coefficient of *investment* is negative yet significant, implying that investment has no significant impact on firm's revenue. Regarding *outsourcing*, we find a positive and significant coefficient, suggesting that firms doing outsource production have a higher level of revenue than their counterparts. Our finding is consistent with Awe, Kulangara, and Henderson (2018) who find that outsourcing enhances firm performance as outsourcing has allowed firms to internally stay focused on more important activities, leading to an increase in performance. In the same vein, *networking* has a positive impact on firm's revenue, shown through positive coefficients from columns [1] to [4]. This suggests that firms having contact with more people in doing business have a better performance, which is consistent with Nguyen and Luu (2013) who highlight that firm's participation in professional associations boosts their performance. In terms of owner's characteristics, we find no significant effects of owner's gender and owner's age on firm performance.

Table 5.14 also presents the inverse Mills ratio that is obtained and calculated from the first step to correct sample selection bias as discussed previously. The significant inverse Mills ratio implies that the coefficient is supposed to pick up the expected value of the error in the firm performance equation. The significant inverse Mills ratio (*P-value* < 0.01) suggests that we can reject the null hypothesis that the errors are uncorrelated. That means, for this problem, selection bias is indeed an issue, and since inverse Mills ratio has been controlled for, this estimate is free-of selection bias. By taking the issue of selection bias into account and addressing it, our main findings turn out to be appropriate and unbiased.

Table 5.14. Innovation and firm performance: Labor productivity

Dependent variable: Labour productivity (log.)	Innovation	New products	Improvements of existing products	New processes
	[1]	[2]	[3]	[4]
Innovation (Yes = 1)	0.106*** (0.037)			
New products (Yes = 1)		0.047 (0.059)		
Improvements of existing products (Yes = 1)			0.090** (0.038)	
New processes (Yes = 1)				0.077 (0.048)
Liabilities (log.)	0.008** (0.004)	0.009** (0.059)	0.008** (0.004)	0.009** (0.004)
Firm age	0.003 (0.003)	0.002 (0.003)	0.003 (0.003)	0.003 (0.003)
Firm size (log.)	-0.199*** (0.045)	-0.020*** (0.045)	-0.197*** (0.045)	-0.199*** (0.045)
Investment (Yes = 1)	-0.134** (0.058)	-0.130** (0.058)	-0.128** (0.058)	-0.139** (0.058)
Outsourcing (Yes = 1)	0.190*** (0.071)	0.197*** (0.071)	0.192*** (0.071)	0.195*** (0.071)
Network size	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
Gender (Male = 1)	-0.086 (0.052)	-0.086** (0.052)	-0.085 (0.052)	-0.088* (0.052)
Owner's age	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)
Inverse Mills ratio (Selectivity-adjusted term)	-0.525*** (0.156)	-0.543*** (0.156)	-0.524*** (0.156)	-0.554*** (0.156)
R-squared	0.130	0.120	0.129	0.518
Location effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes

Dependent variable is firm performance, measured by labor productivity (in logs). Key independent variables are innovation (specification [1]), new products (specification [2]), improvements of existing products (specification [3]), and new processes (specification [4]). Coefficients of individual variables are reported by applying Heckman two-step procedure with fixed-effects regressions. Standard errors are reported in parentheses. *, **, and *** denote the levels of significance at 10%, 5%, and 1%, respectively. All regressions include a constant term. Number of observations is 6,080.

Table 5.15. Innovation and firm performance: Revenue

Dependent variable: Revenue (log.)	Innovation	New products	Improvements of existing products	New processes
	[1]	[2]	[3]	[4]
Innovation (Yes = 1)	0.156*** (0.042)			
New products (Yes = 1)		0.055 (0.066)		
Improvements of existing products (Yes = 1)			0.136*** (0.042)	
New processes (Yes = 1)				0.139** (0.054)
Liabilities (log.)	0.012** (0.004)	0.012*** (0.004)	0.012*** (0.004)	0.012*** (0.004)
Firm age	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)
Firm size (log.)	0.619*** (0.050)	0.624*** (0.050)	0.620*** (0.050)	0.615*** (0.050)
Investment (Yes = 1)	-0.046 (0.065)	-0.039 (0.065)	-0.038 (0.065)	-0.058 (0.065)
Outsourcing (Yes = 1)	0.198** (0.079)	0.208*** (0.079)	0.200** (0.079)	0.204** (0.079)
Network size	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
Gender (Male = 1)	-0.069 (0.058)	-0.069 (0.058)	-0.068 (0.058)	-0.073 (0.058)
Owner's age	-0.001 (0.003)	-0.001 (0.003)	-0.001 (0.003)	-0.001 (0.003)
Inverse Mills ratio (Selectivity-adjusted term)	-0.389** (0.173)	-0.411** (0.175)	-0.388** (0.173)	-0.439** (0.174)
R-squared	0.516	0.516	0.516	0.518
Location effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes

Dependent variable is firm performance, measured by revenue (in logs). Key independent variables are innovation (specification [1]), new products (specification [2]), improvements of existing products (specification [3]), and new processes (specification [4]). Coefficients of individual variables are reported by applying Heckman two-step procedure with fixed-effects regressions. Standard errors are reported in parentheses. *, **, and *** denote the levels of significance at 10%, 5%, and 1%, respectively. All regressions include a constant term. Number of observations is 6,080.

Table 5.16 demonstrates the main findings on the impacts of innovation on value added (in logs). Overall, the empirical results from using the Heckman two-stage approach, after controlling for firm characteristics, suggest that firms having innovation activities do perform better than those not engaging in innovation. The coefficient of *innovation* is positive and significant as shown in column [1], implying a statistically significantly positive impact of innovation on firm's value added. In particular, innovative firms have a higher level of value added by 10.8% than non-innovative firms, holding other factors unchanged. In other words, innovation is a boosting factor to increase firm performance because of applying or improving new technology and/or production processes. In column [2], we find no significant relationship between launching new products and firm performance, which is similar to findings in Table 5. In columns [3] and [4], we present positive and significant coefficients of innovation by improvements of existing products (*coef.* = 0.088) and innovation through new processes (*coef.* = 0.117), respectively. As such, firms with improvements of existing products perform a higher level of value added by 8.8% than their counterparts, holding other things unchanged. In the same vein, innovation through introducing new manufacturing processes fosters the level of firm's value added by 11.7%, holding other factors unchanged.

In a similar setting as shown in Table 5.15, we show in Table 5.16 that firm's value added is positively and significantly affected by liabilities (in logs), firm size (in logs), and outsourcing. We find no significant impacts of firm age, investment, network size, owner's gender, and owner's age on firm's value added.

As discussed, we estimate and generate the inverse Mills ratio from the first step to address the issue of sample selection. We show in four specifications from columns [1] to [4] the negative and significant coefficients of selection term, suggesting that it corrects the expected value of the error in the structural equation of firm performance. The significant inverse Mills ratio (*P-value* < 0.01) suggests that we can reject the null hypothesis that the errors are uncorrelated, showing that selection bias is indeed an issue. As the inverse Mills ratio has been captured, this estimate of our regressions no longer remains selection biased, and our main findings are appropriate and unbiased.

Table 5.16. Innovation and firm performance: Value added

Dependent variable: Value added (log.)	Innovation	New products	Improvements of existing products	New processes
	[1]	[2]	[3]	[4]
Innovation (Yes = 1)	0.108*** (0.036)			
New products (Yes = 1)		0.022 (0.057)		
Improvements of existing products (Yes = 1)			0.088** (0.036)	
New processes (Yes = 1)				0.117** (0.047)
Liabilities (log.)	0.006* (0.004)	0.007* (0.004)	0.006* (0.004)	0.006* (0.004)
Firm age	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Firm size (log.)	0.746*** (0.043)	0.750*** (0.043)	0.747*** (0.043)	0.741*** (0.043)
Investment (Yes = 1)	-0.076 (0.056)	-0.069 (0.057)	-0.070 (0.056)	-0.088 (0.057)
Outsourcing (Yes = 1)	0.178** (0.069)	0.186*** (0.069)	0.180*** (0.069)	0.182*** (0.069)
Network size	0.000 (0.000)	0.001 (0.000)	0.000 (0.000)	0.000 (0.000)
Gender (Male = 1)	-0.026 (0.051)	-0.025 (0.051)	-0.026 (0.051)	-0.030 (0.051)
Owner's age	-0.003 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.003 (0.003)
Inverse Mills ratio (Selectivity-adjusted term)	-0.435*** (0.151)	-0.446*** (0.152)	-0.435*** (0.151)	-0.477*** (0.152)
R-squared	0.610	0.609	0.610	0.610
Location effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes

Dependent variable is firm performance, measured by value added (in logs). Key independent variables are innovation (specification [1]), new products (specification [2]), improvements of existing products (specification [3]), and new processes (specification [4]). Coefficients of individual variables are reported by applying Heckman two-step procedure with fixed-effects regressions. Standard errors are reported in parentheses. *, **, and *** denote the levels of significance at 10%, 5%, and 1%, respectively. All regressions include a constant term. Number of observations is 6,080.

Robustness checks

Table 5.17 presents robustness checks by using an alternative measure of firm performance. To strengthen our main findings on the impacts of innovation on firm performance, we examine whether innovation has an impact on revenue growth, measured by the difference of logarithm of revenue in year t and logarithm of revenue in year $t-1$. Results are shown in Table 5.17. We find that innovation significantly and positively affects revenue growth, as presented in column [1]. The positive coefficient suggests that firms engaging in innovation activities have a higher level of growth by 4.9% than their counterparts, significance at 5% level. Yet, we find positive but no statistically significant impacts of innovation through launching new products and improvements of existing products on firm growth (columns [2] and [3]). Results in column [5] show a positive and significant association between innovation through introducing new production processes and firm growth, suggesting that innovative firms have a better growth than non-innovative peers by 5.9%, holding other factors unchanged. Results confirm our main findings in the previous section that innovation has a positive and significant impact on firm performance.

Regarding control variables, we also find that firm growth is positively and significantly affected by liabilities (in logs), firm size (in logs), and investment. Adversely, we find a negative and significant association between firm age and growth, suggesting that the younger the firm is, the better growth they perform. We find no significant impacts of outsourcing, networking, owner's gender, and owner's age on firm growth.

Following the method procedure, we estimate the inverse Mills ratio from the first step and use in the structural equation in the second step to control for the discussed selection bias issue. We show in four specifications from [1] to [4] the positive and significant coefficients of the inverse Mills ratio. The significant inverse Mills ratio ($P\text{-value} < 0.01$) suggests that we can reject the null hypothesis that the errors are uncorrelated, which reflects the issue of selection bias in this context. As we have controlled for the inverse Mills ratio, our estimate results are no longer selection biased, leading to appropriate and unbiased findings.

Table 5.17. Robustness check: Innovation and firm growth

Dependent variable: Firm growth	Innovation	New products	Improvements of existing products	New processes
	[1]	[2]	[3]	[4]
Innovation (Yes = 1)	0.049** (0.023)			
New products (Yes = 1)		0.008 (0.037)		
Improvements of existing products (Yes = 1)			0.015 (0.023)	
New processes (Yes = 1)				0.059** (0.030)
Liabilities (log.)	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)
Firm age	-0.004** (0.002)	-0.004** (0.002)	-0.003** (0.002)	-0.004** (0.002)
Firm size (log.)	0.109*** (0.028)	0.111*** (0.028)	0.111*** (0.028)	0.106*** (0.028)
Investment (Yes = 1)	0.105*** (0.036)	0.109*** (0.036)	0.109*** (0.036)	0.099*** (0.036)
Outsourcing (Yes = 1)	0.042 (0.044)	0.045 (0.044)	0.045 (0.044)	0.043 (0.044)
Network size	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Gender (Male = 1)	0.051 (0.032)	0.052 (0.032)	0.052 (0.032)	0.049 (0.032)
Owner's age	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)
Inverse Mills ratio (Selectivity-adjusted term)	0.367*** (0.097)	0.363*** (0.097)	0.366*** (0.097)	0.347*** (0.097)
R-squared	0.019	0.018	0.018	0.018
Location effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes

Dependent variable is firm growth. Key independent variables are innovation (specification [1]), new products (specification [2]), improvements of existing products (specification [3]), and new processes (specification [4]). Coefficients of individual variables are reported by applying Heckman two-step procedure with fixed-effects regressions. Standard errors are reported in parentheses. *, **, and *** denote the levels of significance at 10%, 5%, and 1%, respectively. All regressions include a constant term. Number of observations is 6,080.

5.2.3. The combination effects of access to credit and innovation to firm performance

Table 5.18. Combination effects to firm performance

Variable	Labor productivity		Revenue		Value added	
	[1]	[2]	[3]	[4]	[5]	[6]
Access to formal credit	0.213***	(0.062)	0.571***	(0.076)	0.482***	(0.074)
Innovation	-0.110	(0.085)	0.575***	(0.103)	0.765***	(0.096)
Firm age	-0.011***	(0.002)	-0.008***	(0.002)	-0.008***	(0.002)
Assets (log.)	0.197***	(0.015)	0.478***	(0.018)	0.472***	(0.016)
Registration	0.175**	(0.042)	0.386***	(0.046)	0.380***	(0.045)
Investment	-0.069*	(0.041)	0.02	(0.048)	0.019	(0.044)
Network size	0.001***	(0.000)	0.002***	(0.000)	0.001***	(0.000)
Party member	-0.046	(0.061)	0.008	(0.069)	0.075	(0.067)
Owner's age	-0.006***	(0.002)	-0.008***	(0.002)	-0.008***	(0.002)
Gender (Male = 1)	0.097**	(0.039)	0.052	(0.046)	0.069	(0.043)
Education	0.080**	(0.041)	0.329***	(0.046)	0.342***	(0.042)
Location (Urban = 1)	0.247***	(0.049)	0.318***	(0.058)	0.348***	(0.054)
PCI ranking	0.001	(0.001)	0.004***	(0.001)	0.002*	(0.001)
Intercept	8.670***	(0.195)	6.134***	(0.225)	4.980***	(0.202)
Year effects	Yes		Yes		Yes	
R-squared	0.196		0.469		0.5096	
Number of observations	6,080		6,080		6,080	

This table presents the impact of access to credit and innovation on firm performance. Dependent variables are labour productivity, revenue and value added, respectively. Columns [1], [3], and [5] denote the values of coefficients of independent variables. *, **, and *** denote significance at the 10%, 5%, and 1% levels, correspondingly. Robust standard errors are in parentheses shown in Columns [2], [4], and [6]. All regressions include a constant term. Number of observations is 6,080.

Table 5.17 defines the result from the IV regression to analyse the combination effects of access to credit and innovation to firm performance, measured by labor productivity, revenue and value added.

In terms of labor productivity, the results show that the coefficient of access to credit is 0.213 which is positive and statistically significant at 1% significant level (P-value = 0.001). This indicates that increased access to credit has a significant positive impact on labor productivity. However, the coefficient of innovation is -0.11 which is

negative and not statistically significant ($P\text{-value} = 0.197$). This suggests that, when accounting for access to credit, the direct impact of innovation on firm performance is negative but not statistically meaning. This may imply that the effect of innovation is not robust when controlling for access to credit. So, we can conclude that: When both innovation and access to credit are included in the model, the positive effect of innovation observed in the innovation – labor productivity model disappears and becomes negative but insignificant. This might indicate that the benefits of innovation are conditional on having access to credit. Firms that innovate but do not have adequate access to credit may not realize the positive impacts of their innovations fully. This suggests that access to credit might be an essential factor for firms to benefit from their innovations. Firms need both innovation and sufficient access to financial resources to get better gains in performance.

In terms of revenue and value added, the IV regression results provide robust evidence that both access to credit and innovation significantly and positively impact firm performance in terms of revenue and value added. The $P\text{-value}$ of access to credit indicates that this coefficient is highly statistically significant, meaning there is strong evidence that access to credit has a positive impact on revenue and value added. This implies that improving access to financial resources significantly enhances a firm's financial performance. The same result has found with innovation. The $P\text{-value}$ of innovation shows that this coefficient is also highly statistically significant, providing strong evidence that innovation positively affects revenue and value added. This means that engaging in innovative activities substantially boosts a firm's performance. The results indicate that both access to credit and innovation play crucial roles in enhancing firm performance, measured by revenue and value added. It suggests that firms benefit from both financial resources and innovative activities. Firms with better access to credit can more effectively leverage their innovative efforts, as they have the necessary capital to invest in new technologies, research and development, and market expansion. Conversely, firms that innovate can achieve higher returns when they have sufficient financial resources to support and scale their innovative projects. Thus, ensuring that firms have both the financial resources and the ability to innovate is essential for maximizing growth and performance.

It could be explained that firms might prioritize investments differently when accessing credit and engaging in innovation. While investments in innovation and expansion initiatives can lead to revenue growth and increased value added, they may not necessarily lead to immediate improvements in labor productivity. For example,

funds allocated to innovation projects might focus on developing new products or services, expanding market reach, or enhancing operational efficiencies, all of which may not directly impact labor productivity in the short term. This could prompt future research to delve deeper into this problem and uncover the potential impacts of access to credit and innovation on labor productivity in the long term.

CHAPTER 6:

DISCUSSIONS AND RECOMMENDATIONS

6.1. Discussions of the findings of the research

This research brings several key empirical findings.

First, firm's credit access is measured by a dummy variable, in which a firm is considered to have credit access if it obtained either short term or long term loans or if it had informal loans. The investigation of both formal and informal financing enables us to comprehensively analyse the probability of firms having credit access as well as the effect of both capital sources on firm-level labour productivity.

Second, a longitudinal dataset on manufacturing SMEs scattered across Vietnam is generated by using data from a biennial SME survey from 2005 to 2013 and an annual PCI survey. The unique detailed dataset allows us to do a long-term analysis of the determinants of access to credit and the impact of credit access on labour productivity of SMEs in Vietnam. Although the Vietnam SME Survey data has been previously applied in several studies on credit and performance (Nguyen and Luu, 2013; Phan et al., 2015; Tran and Santarelli, 2013; Rand, 2007), this paper, to the best of our knowledge, is the first to make use of every available wave to create a long-term panel dataset for analyses. A unique dataset of SMEs and the business environment in Vietnam is constructed with the purpose to offer a comprehensive picture of the two most vital factors of SMEs' dynamics and growth, namely credit access and labour productivity.

Third, a two-stage regression method is applied to discover the determinants of credit access and its influence on labour productivity of firms. The instrumental variable regression for panel data is applied in the second stage as an efficient tool to overcome the problems of endogeneity. Two instrumental variables, captured by the distance from the firm to the most important creditor in terms of loan size and by credit history of firms, prove their validity as they are correlated to the likelihood of firms having credit access but not associated with firm's labour productivity.

Fourth, this study finds that among SMEs, larger firms are more likely to have credit access than their counterparts. Besides, those making investment are 3.3-times more likely to have credit access than those which did not. Firms participating in more business associations are more likely to approach credit. Credit history and the distance

from firms to the most important creditor in terms of loan size positively affect credit access. In terms of owner characteristics, firms whose owners are members of the Communist Party are more likely to have access to capital, while no significant effects of age, gender and educational level of the owner on firm's credit accessibility are found. With regard to the business environment, urban location and PCI ranking negatively affect the likelihood that firms have credit access.

Fifth, we find that credit access has a positive effect on firm's labour productivity. Credit-accessed firms have a higher level of productivity by 24.7 percent than their counterparts, affirming that better access to credit leads to better firm performance for the case of SMEs in Vietnam. Moreover, firm labour productivity is positively affected by a series of variables including firm size, registration under the Law on Enterprises, network size, gender, education of the owner, and urban location. Conversely, firm age and owner's age have negative impacts on the productivity.

We explore data from the Vietnam Manufacturing Small and Medium Sized Enterprises Survey to examine the impact of innovation of firm performance through revenue from sales (in logs) and value added. By applying the two-step Heckman modelling strategy and fixed-effects regressions, we find that innovation has a positive impact on firm performance as measured by revenue and value added, suggesting that innovative firms remain a higher level of performance than their counterparts. We also demonstrate other findings: firm's liabilities (in logs) have a positive impact on their performances; firm size positively affects firm's revenue and value added; and outsourcing increases firm performance. We find a positive and significant influence of business networking and firm's revenue, yet the influence is no significant when firm performance is measured by value added. We also find no significant impacts of firm age, investment, owner's gender, and owner's age on firm performance. In this study, we provide evidence on the positive influence of innovation through making improvements of existing products and launching new production processes on firm performance, suggesting that the more likely firms engage in improving existing products and/or launching new manufacturing processes, the higher level their performances is. We find no significant impact of innovation through launching new products to the markets on firm performance. Interestingly, we find the combination of innovation and credit access has no effect on labor productivity but has strong and significant effects on financial performance, including revenue and value added.

6.2. Theoretical contributions

Our paper contributes to literature on the topic of access to credit, innovation and firm performance, especially to the strand of literature conducted in the context of developing countries like Vietnam—a fast growing country in Southeast Asia and a member of ASEAN (the Association of Southeast Asian Nations).

Our research brings some contributions to the literature.

First, this research addresses a critical gap in the literature by examining the combined effects of innovation and access to credit on firm performance, employing the Theory of the Growth of the Firm and Resource-Based Theory. While previous studies have often focused on individual factors influencing firm performance, such as innovation or access to credit separately, this study is among the first to emphasize the synergistic impact of both factors. The integrated approach highlights the importance of considering multiple dimensions to understand how firms can leverage their resources effectively to enhance performance. This approach aligns with calls from scholars for more comprehensive examinations of the factors that drive firm growth and productivity.

Second, the study distinguishes itself by utilizing a unique longitudinal dataset derived from manufacturing SMEs across Vietnam. This dataset, which spans from 2005 to 2013, includes data from a biennial SME survey and an annual Provincial Competitiveness Index (PCI) survey. This is the first instance where every available wave of data has been integrated to form a long-term panel dataset for analysis. Most existing studies on SME performance have relied on cross-sectional data or shorter time frames, limiting their ability to capture long-term trends and dynamics. By employing a comprehensive dataset, this research provides a more nuanced and detailed examination of SME growth and performance in Vietnam, capturing the intricacies of their operations and the broader business environment.

Third, the paper contributes novel insights by being the first to investigate the combined effects of access to credit and innovation on firm performance, measured by labor productivity, revenue, and value added. It effectively addresses the endogeneity issue in the data through the application of three instrumental variables: distance, credit history, and the mean of innovation, ensuring accurate and unbiased results. Interestingly, the findings reveal that while the combination of access to credit and innovation does not have a significant effect on labor productivity, it does lead to a notable increase in both revenue and value added for firms. This sheds light on the

relationship between financial access, innovation, and firm performance, highlighting the importance of considering multiple dimensions when analyzing their impact on business outcomes.

Through the rich data and clear analysis, our study endeavors to shed light on the interplay between credit access, labor productivity, and SME growth in the Vietnamese context. By providing insights into the dynamics of these pivotal factors over time, we seek to inform policymakers, practitioners, and stakeholders about the challenges and opportunities facing SMEs in Vietnam.

6.3. Recommendations for researchers and practitioners

It is believed that the relationship between financing and SME growth is like the wheels of a car as the synchronisation of all components leads to a balanced and sustainable development of firms in particular and of the economy in general (Shinozaki, 2012). Therefore, one of the top priorities of each country, especially the developing nations, is to facilitate SMEs in their business to promote the national economic growth. To do so, adequate credit plays a crucial role in the survival and growth of firms, suggesting the importance of financial accessibility for the private sector's development on the side of a balanced global economy. Because SMEs have different demands for credit at different business stages, the efficiency of lending and the diversification of credit mechanisms should be essentially improved and tailored to facilitate SMEs having access to credit.

In the case of Vietnam, from the recognition of SMEs' difficulties in having credit access, the Draft Law of Supporting SMEs by the Vietnamese government intends to modify terms and conditions for both formal lenders and SMEs. Accordingly, the SME-supporting agents will help the firms have access to credit more easily by consulting loan applications, planning feasible business projects, and guiding them to use loans effectively. It is stipulated that commercial banks set up the proportion of loans for SMEs to be at least 30 percent of the total loan portfolio. To make this rate of funding, commercial banks should focus more on SME clients by offering banking products and services, credit bank guarantee, discount, financial leasing, and other credit operations in accordance with the size and characteristics of SMEs.

With regard to labour productivity, policies should focus on pursuing sustainable employment growth by increasing efficiency and productivity of the labour force. It is necessary to invest in human capital and provide workers with appropriate training programmes and education opportunities to enhance their existing knowledge and skills that meet the requirements of employers (Meyer-Boehm, 2002). Besides, incentives-related policies should be considered because of their positive impact on labour

productivity. In sum, policy implications mentioned above are expected to assist the policy makers in Vietnam with inclusive viewpoints in facilitating SME access to credit and increasing firm labour productivity.

SMEs need to increase investment and application of technology in preparing accounting books, tax declaration and electronic customs, and banking transactions via the internet to reduce transaction costs, connect and share financial information with credit institutions to gradually make financial information transparent and create trust in the market. Improve the quality and level of corporate governance, risk management and financial management; Actively participate in business associations to access information about policies and support programs for SMEs of the Government, State government as well as credit institutions. Completing the production process, improving product quality to meet the supply chain participation standards of major partners, especially the ability to participate in the global supply chain.

For credit institutions

Banks need to increase their search for and access to capital sources from preferential programs and projects of domestic and foreign organizations to finance specific business areas of SMEs approved by the Government. The State needs to focus on banking service development. Design specific loan products suitable for SME customers according to each industry group to have solutions to flexibly meet customer requirements. At the same time, improve and simplify the lending process, request information provided in accordance with reality and provide detailed advice and instructions so that SMEs can easily grasp and implement.

Credit institutions continue to develop appropriate credit policies for each type of business. At the same time, improve the efficiency of inspection and supervision of businesses' use of loan capital after disbursement; Strengthen risk management, bad debt management... Also accurately analyze and evaluate the profitability of the business to determine a reasonable lending interest rate, ensuring mutual development.

Credit institutions need to improve their ability to forecast and perform well their role in advising customers on loan interest rates to help businesses prevent and limit risks. At the same time, regularly and promptly implement preferential policies and share difficulties regarding interest rates with customers. Consider and promote unsecured lending, evaluate the effectiveness and profitability of investment projects to finance businesses. Proactively reevaluate debts, extend debts, pay off debts, and work with businesses to overcome difficulties and restore production. Debt restructuring, debt

rescheduling, credit incentives for businesses, if businesses can prove revenue sources to repay bank debt; Develop financial leasing to help businesses quickly innovate technology...

For promoting innovation in SMEs

Our findings imply policy recommendations. As product-improvements innovation and new-processes innovation are more focused and remain their significant role in increasing firm performance as compared to new-products innovation, firms might consider mobilising resources to facilitate improvements in manufacturing processes. Firm's managers might consider creating a work group that focuses on firm's planning and innovation so as to keep the business up-to-date with changes in technology and markets, especially those from developed countries, thus to make plans for any updates or changes in the existing products and/or launch new production processes, resulting in better performances.

Firstly, the competitiveness of businesses is the weakest point that needs to be overcome. In addition, businesses have difficulty accessing capital, new markets, innovating equipment, determining business strategies and management capacity. From the above reality, from the perspective of the role of science and technology in the sustainable development of businesses when Vietnam implements new generation free trade agreements; Small and medium-sized enterprises need to continue to innovate their thinking and act more decisively to innovate technology in businesses.

Businesses' approach to technological innovation needs to be more comprehensive and synchronous; It's not just a matter of innovating tools, machinery, and equipment. This is just the hardware in technological innovation. Businesses need to focus on all three software elements of technology: information elements, methods, processes, and know-how; organizational, management and human factors. When all four factors above are coordinated, it will certainly improve production and business efficiency and the competitiveness of each enterprise.

Second, businesses, especially small and medium-sized enterprises, need to proactively review and objectively evaluate the application, transfer innovation of technology in production and business to see where they stand. The level of science and technology is advanced, average or backward; What percentage of revenue does investment in technology innovation reach? Evaluate business's ability to access new technology to see which stages are the most difficult and weakest. Then compare them with the standards and conditions of new generation Free Trade Agreements to serve as

a basis for planning and building specific plans for technological innovation and flexible human resource training in accordance with the conditions and circumstances of each business. Thereby, constantly improving product quality and competitiveness of businesses.

Businesses that have the means should invest in scientific research activities to have new technical solutions and technological solutions to create new products to meet market needs.

Third, a series of new-generation Free Trade Agreements, including participation in TPP, requires not only businesses but also the political system, all levels, sectors, and all people to make efforts to overcome difficulties. The Government needs to adjust and supplement tasks and solutions to support businesses in technological innovation; create conditions for businesses to develop in depth based on innovation and achievements of science and technology. These include important solution tasks related to intellectual property rights protection; Promote the creation, exploitation and management of intellectual property of enterprises; create conditions for businesses to access, exploit and effectively use scientific and technological advances; Support businesses to access and effectively use capital from the Technology Innovation Fund and other support programs. Early develop and implement the Small and Medium Enterprise Development Project to encourage business development; The project requires the participation of the science and technology industry and associations; clearly define the technological innovation roadmap of businesses to meet the requirements when Vietnam implements new generation free trade agreements.

6.4. Recommendations for policy makers

To facilitate access to finance for SMEs

To continue promoting the role of SMEs and overcoming difficulties and obstacles in the current competitive and integrated environment, it is necessary to pay attention to some of the following key solutions:

Firstly, the State creates a favorable investment and business environment for SME development to ensure maintaining confidence and increasing investment. Accordingly, it is necessary to ensure macroeconomic stability, control inflation, and accelerate the process of restructuring the economy associated with innovating the growth model. Strengthen mechanisms and policies to encourage business establishment; narrow conditional business areas, create conditions for the private economy to invest, develop production and business in industries, fields and areas that

are not prohibited by law, in accordance with the development strategy and socio-economic development in each period.

Second, continue to have policies to support SMEs in accordance with the practical requirements of businesses as well as the business environment. Accordingly, the State's support for SMEs must be based on legal foundations, provisions of national law, and compliance with international commitments in multilateral and bilateral agreements of which Vietnam is a member. Support based on this principle will ensure that legal barriers or discrimination between businesses are not created.

Third, the 2017 Law on Support for SMEs took effect from January 1, 2018, but regulations on support for capital access are still quite modest and lack a basis for implementation in practice. Therefore, in the coming time, the State Bank needs to research policies to support businesses in production and business activities. In addition, credit institutions need to strengthen the effective implementation of the Government's executive documents on supporting and developing businesses; Decree No. 34/ND-CP on the establishment, organization and operation of the Credit Guarantee Fund for SMEs; Decree No. 39/ND-CP on the organization and operation of the SME Development Fund...

Forth, promote the development of the capital market. It is necessary to take measures to encourage capital market development to create conditions for businesses to mobilize capital through the issuance of bonds, stocks, as well as investment funds, reducing excessive dependence on loan capital. In particular, it is necessary to focus on promoting the development of credit rating services to support the stock market and bond market, improve openness and transparency, and promote capital mobilization through the stock market, protect the rights and interests of investors.

Fifth, continue to promote reform of administrative procedures in the field of tax and customs: (i) Promote reform of tax administrative procedures through promulgating a risk management regime for enterprises subject to tax inspection/examination; continue to amend regulations on tax refund dossiers, software to support the automatic creation of tax refund dossier reports; submit tax refund documents online; Build a database on tax refund management and make it public so that tax refund recipients can know information about the status of tax refund applications; (ii) Deploy synchronously and widely the application of information technology in declaring, paying taxes, refunding taxes, paying taxes via mobile, and paying via the internet; (iii) Complete the legal framework to ensure full implementation of the electronic customs clearance system...

Sixth, it is necessary to encourage and support SMEs to invest in research and development activities, application and transfer of advanced technology; perfect and ensure effective enforcement of intellectual property laws; develop funds to support innovation and technology application; Apply tax policies, financial support, and access to preferential capital sources suitable for research, innovation, and technological modernization activities; connecting businesses, startup ideas, and innovations with investors and investment funds.

Seventh, it is necessary to actively propagate and raise awareness about information transparency for small and medium-sized enterprises. The Vietnam Association of Small and Medium Enterprises needs to regularly implement solutions to encourage small and medium enterprises to gradually disclose information and apply the governance model of public companies. Improved information transparency will be an important premise to help small and medium-sized enterprises gradually access the corporate bond market in the future. They also need to regularly organize seminars and professional training classes on the financial market to introduce the role, benefits, and ways to exploit other capital mobilization channels in the financial market, through that helps small and medium-sized enterprises reduce their dependence on loans from credit institutions.

To promote innovation activities in SMEs

To remove barriers in applying science and technology and promote sustainable development, it is necessary to implement a number of policies and applicable solutions such as:

Increasing investment and technology research and development: This is an important factor to enhance the potential and competitiveness of technology applications. The government and relevant organizations need to create better conditions for researchers and companies to access resources and finance to develop new technologies. Governments can establish investments and policies that encourage businesses, research organizations and universities to engage in research and development of new technologies.

Define and promote intellectual property rights: Governments and authorities need to establish and apply intellectual property protection policies to encourage creativity and fairness in technology sharing. This also ensures that technology creators receive a fair share of benefits and incentives to invest in research and development. Encourage public-private cooperation, create favorable conditions and mechanisms to

encourage cooperation between businesses, research organizations and universities to make the most of resources and knowledge.

Developing technology infrastructure: To apply technology for sustainable development, it is necessary to invest in technology infrastructure, including telecommunications and internet networks. This helps expand the reach of technology and increase the usability of technology applications in fields such as agriculture, health and environment.

Support and encourage technology businesses: The government needs to build a friendly and stable environment for technology businesses to encourage investment and development. This could include reducing taxes and fees, facilitating rapid settlement for technology professionals and providing financial support for potential technology projects.

Create policies and regulations to ensure data security and protection: To increase trust and ensure safety in the application of technology, the Government needs to establish clear policies and regulations on data protection data and user privacy. The above measures can help remove barriers and promote sustainable development in the application of science and technology. However, cooperation between government, business and the community is needed to achieve the best results.

Preferential tax policy: The Government can establish preferential tax policies for research and development activities, as well as the application of new technology in production, especially effective application in the fields of research and development. Rapid transformation in green development, circular economy, digital data management...

Support for training and human resource development: The government can provide support to train and develop highly specialized human resources in the field of science and technology.

Support businesses to apply science and technology in developing green economy and circular economy: Providing resources and finance in training, developing science and technology and on-site applications, and having preferential policies for innovative businesses creativity and technological innovation to improve productivity, reduce environmental risks, effectively enhance competitiveness, and create a good environment to attract investment from large enterprises around the world.

The application of science and technology in the era of the 4.0 revolution, digital transformation, digital economy and artificial intelligence is playing an extremely

important and urgent role in sustainable development in the world and in Vietnam. This has become a prerequisite for the survival of businesses and entrepreneurs in Vietnam, and is an important "pull" to improve national capacity. Therefore, to realize the country's common goals, objectives and directions for science and technology development, it is necessary to set out and drastically and synchronously deploy effective science and technology development policies and solutions. Vietnamese business and entrepreneur need to raise awareness of the role and responsibility of science and technology human resources for the country's economic and social development.

6.5. Limitations and future research direction

This dissertation has some limitations:

The major limitation of this research is the lack of data. Although the database used in this research is widely used to analyze SMEs in Vietnam, it covers about 2,500 firms in only nine provinces/cities in Vietnam over 8 years. One significant limitation of this thesis is the lack of updated data. No further survey has been undertaken since 2015, resulting in the use of potentially outdated information. The author acknowledges this as a limitation, recognizing that more recent data could provide a more accurate and current analysis of the relationship between credit access, innovation, and firm performance among Vietnamese SMEs.

In addition, this dissertation only analyzes the synergistic impact of access to credit on firm productivity, while credit may perform in formal and informal finance. The same logic applies to innovation.

In terms of business and economics, the correlation between innovation and access to credit stands as a pivotal point of interest, often perceived as a catalyst for firm growth and development. However, despite the significance of this relationship, my research has encountered limitations of exploration of this dynamic relationship.

One of the primary limitations of my research lies in its inability to establish a clear relationship between innovation and access to credit. While existing literature suggests a positive association between the two variables, indicating that enhanced innovation capabilities can lead to improved access to formal credit channels, my research failed to substantiate these claims. According to some studies, innovative firms tend to attract greater attention from financial institutions, particularly during times of economic crisis, when innovation becomes a crucial survival strategy. Conversely, other research highlights the notion that improved access to credit can foster innovation within firms.

With readily available capital, companies can invest in innovative endeavors aimed at bolstering competitiveness, augmenting revenues, and enhancing overall performance.

Additionally, the instrumental variable – distance between firms and banks shows some possible limitation. For example, banks are often located in urbanized and developed areas. As a result, if firms are located near banks, they are more likely to operate in favorable areas, which in turn makes them perform better. This potential relationship could violate the assumption that the instrument should not be directly correlated with the outcome and the error term.

Nevertheless, despite these theoretical underpinnings, my research was impeded by a lack of comprehensive data and constraints in terms of time. The absence of robust datasets pertaining to innovation activities and credit accessibility forces the research to define their relationship. As a result, the research was unable to provide definitive insights into the dynamics between innovation and access to credit. The absence of empirical evidence limits the generalization of the findings regarding the interplay between these two factors.

These limitations underscore the necessity for future research endeavors to delve deeper into this subject matter. Addressing the gaps identified in this study, future research could adopt more robust methodologies, employ longitudinal analyses and comprehensive datasets to investigate the relationship between innovation and access to credit. Additionally, exploring contextual factors and industry-specific context may offer valuable insights into how different firms navigate their innovation activities and credit accessibility.

In conclusion, while my research endeavors to shed light on the relationship between innovation and access to credit, it is crucial to acknowledge the inherent limitations. By recognizing these constraints and charting a course for future research, scholars can endeavor to reveal the relationship of innovation and credit dynamics, thereby contributing to the broader discourse on firm growth and economic development. Future research may extend our findings to other countries.

CONCLUSION

Credit and innovation are crucial issues for firm development. Difficulties in access to finance and applying innovation activities put SMEs in difficult situations. The reason why the development of SMEs has not been as expected is due to many factors, some of them stems from problems with institutions, policies, administrative procedures, lack of capital, investment and business conditions, skilled labor shortage; low labor productivity. All above, lack of credit and innovation are two biggest obstacles SMEs may face.

Therefore, this study aims to examine the effect of access to credit on labour productivity and the impact of innovation on firm's revenue and value added. This study is motivated by the theory of the growth of the firm (Penrose, 1959) and Resource – based theory (Grant, 1991)

A quantitative research survey was conducted to investigate the hypothetical relationships proposed in the theoretical framework. The data used in the research is from two surveys including the Vietnam SME Survey and the Provincial Competitiveness Index. The first survey was biennially carried out from 2007 to 2015 in ten cities and provinces across Vietnam (Ha Noi, Phu Tho, Ha Tay, Hai Phong, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Hochiminh City, and Long An). The second survey is PCI survey which was carried out from 2005.

The data collected is tested for endogeneity and biases selection. The IV model and two-step Heckman model are applied to solve these problems. Collected data were analyzed with statistical software of Stata.

Overall, after analyzing the data and discussing the analysis results, it was determined that this research has achieved all objectives of this research were achieved. Specifically, the research has:

- *analyse the effect of access to credit on firm performance*, achieving research objective 1;
- *examine the impact of innovation on firm performance*, achieving research objective 2.
- *Investigate the combination effects of both access to credit and innovation on firm performance*, achieving research objective 3

Our findings are expected to contribute to literature on innovation, access to

credit and their impacts on SMEs' performance in developing countries, focusing on Vietnam. We contribute to the literature by applying the instrument variables and the Heckman two-step procedure to address the issue of models, including endogeneity and biases selection. Our study provides a fresh insight for researchers and practitioners to facilitate firms to obtain credit, both formal and informal credit, and innovation activities, particularly to improve existing products and/or introduce new production processes, thus to foster SMEs' performances.

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