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The Impact of Venture Capital on Growth via Innovation and Internet Technology Adoption in Indonesia's Micro and Small Industries

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ABSTRACT

One of the major challenges faced by Micro and Small Industries (MSIs) is access to financing. Venture capital serves as a potential solution to address capital constraints by offering both financial and non-financial support. This study aims to examine the effect of venture capital on the growth of MSIs in Indonesia, with innovation and internet technology serving as mediating variables. The research utilized survey data from *Badan Pusat Statistik* (BPS), comprising a sample of 83,616 MSIs. The analysis employed logistic regression using STATA and the Sobel test to assess mediation effects. The findings indicate that venture capital has a positive, albeit statistically insignificant, direct effect on MSI growth. However, innovation was found to significantly mediate the relationship between venture capital and growth, whereas internet technology did not exhibit a mediating effect. These results suggest that venture capital fosters innovation, which in turn contributes to business growth.

Keywords: *venture capital, growth, innovation, use of internet technology.*

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1. | INTRODUCTION

Micro and Small Industries (MSIs) play a pivotal role in driving economic growth, job creation, and poverty reduction, particularly in developing countries like Indonesia. Despite their importance, MSIs often face a multitude of challenges that hinder their development and competitiveness. One of the most persistent and critical issues is access to adequate financing. Conventional financing channels, such as bank loans, frequently impose collateral requirements and complex administrative procedures that are difficult for early-stage or small-scale enterprises to meet. This financing gap presents a significant barrier to scaling operations, adopting new technologies, and pursuing innovation.

Venture capital emerges as a promising solution to this financing conundrum. Unlike traditional financial institutions, venture capitalists are willing to assume higher risks in exchange for the potential of high returns. They provide not only capital but also strategic support, mentorship, monitoring, and access to business networks (Gornall & Strebulaev, 2021; Harrison et al., 2020). This type of financing is especially critical for startups and MSMEs that lack collateral but have strong growth potential. Empirical evidence from various countries demonstrates the positive impact of venture capital on firm performance, innovation capacity, and long-term growth (Engel, 2002; Peneder, 2010; Biney, 2018; Du & Cai, 2020).

In the Indonesian context, the role of venture capital remains underdeveloped and underutilized, particularly by MSIs. According to BPS (*Badan Pusat Statistik*) (2022), only 0.17% of Micro and Small Industries reported using venture capital financing as of 2019. This is a stark contrast to the growing recognition of venture capital's potential in supporting business expansion, especially in sectors that require technological innovation and market adaptation. The Indonesian National Industrial Development Master Plan (2015–2035) has identified MSIs as vital contributors to national industrial output and economic transformation. Yet, many MSIs still face significant constraints in accessing the resources necessary to innovate and grow.

This research focuses on MSIs rather than the broader category of Small and Medium Enterprises (SMEs) for two key reasons. First, MSIs represent the vast majority of industrial enterprises in Indonesia, particularly in sectors such as food processing, textile production, wood and rattan furniture, and other manufacturing segments employing between 1 and 20 workers (BPS, 2019). Second, MSIs are prioritized in national industrial policy as a mechanism for inclusive economic development and grassroots empowerment. Given their scale and constraints, MSIs require targeted research attention, especially regarding alternative financing mechanisms like venture capital.

In addition to direct financial support, venture capital has been linked to enhanced innovation capabilities and greater adoption of internet-based technologies—both of which are vital for modern business growth. Innovation, as measured by the registration of trademarks and other intellectual property rights, signals a firm's commitment to

product development and differentiation. Previous studies have shown that venture capital funding often leads to increased innovation activities, especially in technology-intensive sectors (Peneder, 2010; Du & Cai, 2020). Likewise, the adoption of internet technology enables firms to access new markets, improve operational efficiency, and enhance customer engagement. This is particularly relevant in the digital era, where e-commerce and digital marketing offer significant opportunities for small businesses (Pradhan et al., 2019; Onileowo & Fasiku, 2021).

However, while prior studies have extensively explored the relationship between venture capital and growth in SMEs, little attention has been given to Micro and Small Industries in Indonesia. Furthermore, the potential mediating roles of innovation and internet technology adoption in this relationship have not been adequately examined. This study seeks to fill this gap by investigating the direct and indirect effects of venture capital on MSI growth. Specifically, it explores whether innovation and internet technology serve as intervening variables in the relationship between venture capital and business expansion.

By focusing on these mediating factors, the study draws upon resource-based and innovation diffusion theories, which suggest that access to external capital can facilitate internal capability development, leading to improved performance outcomes. It also contributes to the understanding of how financial mechanisms like venture capital interact with technological adoption to influence firm growth—an area that remains underexplored in the Indonesian MSI context.

This research aims to make a theoretical and practical contribution in several ways. Theoretically, it extends the literature on venture capital by contextualizing its role within the MSI sector of a developing economy. Methodologically, it utilizes a robust dataset from BPS comprising 83,616 MSI respondents, analyzed using logistic regression and the Sobel test to assess mediating effects. Practically, the findings can inform policymakers, venture capital firms, and MSI stakeholders about the potential of venture capital to foster sustainable growth through innovation and digital transformation.

In light of the issues discussed, this study formulates the following research questions; 1) Does venture capital directly influence the growth of Micro and Small Industries (MSIs) in Indonesia?; 2) Does venture capital indirectly influence MSI growth through the mediating role of innovation, particularly in the form of registered trademarks or intellectual property rights?; 3)Does venture capital indirectly influence MSI growth through the use of internet technology as a mediating variable?. By addressing these questions, this study aims to provide comprehensive insights into how venture capital can be leveraged more effectively to support the development of Micro and Small Industries in Indonesia, contributing both to academic understanding and practical policy-making.

2. | LITERATURE REVIEW

Financial support serves as a crucial foundation for business development, particularly for early-stage companies striving to achieve rapid growth. One important alternative financing source that has gained attention globally is venture capital. Unlike traditional bank loans, venture capital represents a non-bank financial mechanism offering not only equity funding but also strategic support to high-potential firms that often lack sufficient collateral or access to credit. In mature financial markets, venture capital has played a central role in the emergence of globally successful companies such as FedEx (Du and Cai, 2020). Venture capitalists act as active investors, contributing financial resources and valuable non-financial services, including mentorship, strategic advice, market access, and business network development (Keuschnigg and Nielsen, 2004; Hochberg et al., 2007).

This involvement ranges from assisting with financial management to building relationships with customers and suppliers, positioning venture capitalists as key actors in guiding firms toward long-term sustainability and growth (Timmons and Bygrave, 1986; Bottazzi and Da Rin, 2002). Their engagement also accelerates firms' professionalism, strategic alignment, and market expansion (Hellmann and Puri, 2000), while their added value has been categorized into eight types: legitimacy, outreach, strategic planning, consulting, recruitment, mandating, mentoring, and operating (Large and Muegge, 2008). Peneder (2010) describes three main functions of venture capital: providing financing to firms facing asymmetric information and uncertainty, selecting and allocating resources to the most profitable ventures, and offering managerial support and operational guidance to boost firm performance.

Empirical research provides further support for the positive effects of venture capital on innovation and growth. Engel and Keilbach (2007) found that young German companies with greater patent activity were more likely to receive venture capital funding and that those receiving such funding experienced significant labor growth. In the United States, Kortum and Lerner (2000) highlighted that venture capital accounted for 15% of industrial innovation, indicating a high impact relative to its financial share. Hellmann and Puri (2000) reinforced this by showing that venture capital enhances both innovation output and the speed at which products reach the market. However, not all findings are conclusive. Pradhan et al. (2018), using various innovation proxies such as patents, trademarks, R&D, and innovation activities, found no strong causal relationship between venture capital and innovation. Yet, other studies offer contrasting insights. In Japan, Ueda and Hirukawa (2008) identified a positive and significant impact of venture capital on patent generation, while Faria and Barbosa (2014), using panel data from 17 U.S. states, emphasized venture capital's role in the final stages of the innovation process particularly in transforming innovation into marketable outcomes.

Overall, the literature portrays venture capital as a multidimensional force that not only supplies capital but also enhances innovation capabilities, professionalizes

business operations, and stimulates firm growth. While such roles are well-documented in developed countries, research on venture capital's impact in developing economies, especially among Micro and Small Industries (MSIs), remains limited. This gap is particularly relevant in Indonesia, where MSIs are prioritized in the national industrial development agenda yet continue to face financing challenges. Understanding the mechanisms through which venture capital can drive innovation, facilitate technology adoption, and improve growth outcomes in Indonesian MSIs is essential for designing effective policies and financial instruments aimed at fostering inclusive and sustainable economic development.

Relationship between Venture Capital and Innovation

Firms supported by venture capital tend to exhibit higher levels of innovation compared to those that are not, reflecting the critical role of venture capital in fostering technological advancement and competitiveness. In the context of the United States, research by Greenwood et al. (2022) demonstrated that innovation, measured using patents, significantly contributes to firm growth among companies that receive venture capital funding. This is further supported by Gornall and Strebulaev (2021), whose findings revealed that venture capital plays a substantial role in the U.S. economy by contributing to 82% of public companies, many of which are renowned for their innovation, including Tesla, Apple, Starbucks, and Costco Wholesale. Moreover, Pradhan et al. (2019) emphasized that risk capitalvtypical of venture capitalvserves as a catalyst for applied and translational research within the industrial sector, encouraging technological development and commercialization. Similarly, Popov and Roosenboom (2012) found that from 1991 to 2005, venture capital contributed 10.2% to innovation activities across ten key industrial sectors, underscoring its importance in advancing industrial innovation.

However, the relationship between venture capital and measurable innovation outcomes is not always linear or consistent across studies. For instance, Engel and Keilbach (2007), in their study on early-stage German companies, reported no significant difference in patent counts before and after venture capital investment, suggesting that while venture capital may stimulate growth, it does not always translate into immediate increases in patent activity. This discrepancy may be due to varying innovation metrics used in different contexts and timeframes. Recognizing the limitations of patents as the sole proxy for innovation, this study employs trademarks as an alternative indicator to capture the broader spectrum of innovation within Indonesian Micro and Small Industries (MSIs). By doing so, the research aims to assess whether venture capital can meaningfully enhance innovation output among MSIs in Indonesia—an economy where venture capital remains underutilized but holds substantial potential. Given this rationale, the study posits the following hypothesis:
Hypothesis 1: Venture capital has a positive and significant influence on innovation.

Relationship between Innovation and Growth

Innovation plays a crucial role in driving the growth of business entities. Adam and Alarifi (2021) demonstrated that innovative practices significantly and positively impact the performance and sustainability of SMEs in Saudi Arabia. Similarly, Gohar et al. (2020) explored the role of innovation in fostering the growth of SMEs in Pakistan. Hall et al. (2009) also confirmed that innovation enhances SME productivity, particularly in relation to process improvements. Supporting this, Frimpong et al. (2022), through an analysis of macro-level data from European countries, found that innovation contributes to company growth within the health sector. In another context, Mwangi and Namusonge (2014) examined how innovation affects the development of SMEs in Nakuru's manufacturing sector, concluding that innovation indeed supports business expansion. Prior studies have employed varying levels of analysis some focusing on individual firms (micro-level) and others on broader national contexts (macro-level). This current research adopts a micro-level approach to assess the impact of innovation. Based on this framework, the following hypothesis is proposed: Hypothesis 2: Innovation has a positive and significant impact on growth.

Relationship between Venture Capital and Growth

Frimpong et al. (2022) discovered that venture capital has a beneficial effect on company growth within the health sector, using indicators such as venture capital income and investment. Similarly, Greenwood et al. (2022) investigated the impact of venture capital on companies both those supported and unsupported by such funding using various growth metrics including R&D-to-sales ratios, workforce expansion, revenue growth, and firm valuation. Their findings revealed that venture capital significantly enhances company revenue. Engel (2002), through a comparative study in Germany, showed that firms backed by venture capital tend to achieve higher profitability compared to their non-venture-backed counterparts. In Ghana, Biney (2018) utilized propensity score matching and difference-in-difference estimation methods to assess the relationship between venture capital financing and SME development. The study found a strong, positive correlation, particularly when using employment and sales as proxies. Engel (2002) also highlighted that early-stage firms in the tech sector funded by venture capital exhibited greater employment growth within three years than those without such support, attributing this to venture capital's role in screening, consulting, and monitoring. Supporting this, Peneder (2010) employed a two-stage PSM approach with Austrian microdata, concluding that venture capital contributes positively to firm growth measured through sales and employment. Research in Kenya by Memba et al. (2012) found a post-investment increase in employee numbers among SMEs receiving venture capital. Similarly, Belke et al. (2003) and Bertoni et al. (2011) affirmed that venture capital investment significantly boosts labor growth. Furthermore, Mirza and Sabah (2018) emphasized the role of venture capital in job creation, highlighting its broader benefits for the workforce. These findings collectively underscore the pivotal role of venture capital in fostering

business growth across both developed and developing economies. In line with these observations and to assess the relevance of venture capital in enhancing the growth of Indonesian Micro and Small Industries (MSIs), this study proposed the following hypothesis:

Hypothesis 3: Venture capital has a positive and significant influence on growth.

Mediating Role of Innovation

The connection between venture capital, innovation, and company growth can be understood by examining the interrelationships among these variables, as evidenced in prior research. Biney (2018) demonstrated that venture capital funding has a positive and significant effect on the growth of small and medium enterprises (SMEs). Similarly, Engel (2002) explored how venture capital influences companies' innovation behavior and found that firms supported by venture capital tend to be more innovative and grow more rapidly than comparable firms without such support. This is supported by Peneder (2010), who noted that venture capital typically targets companies with strong innovative potential. Moreover, Adam and Alarifi (2021) highlighted that the implementation of innovation practices significantly enhances the performance and sustainability of SMEs in Saudi Arabia. These findings suggest that venture capital may not only have a direct effect on company growth but also exert an indirect influence by promoting innovation. Based on this reasoning, the following hypothesis was proposed:

Hypothesis 4: Venture capital positively and significantly influences growth through innovation.

Relationship between Venture Capital and the Use of Internet Technology

Pradhan et al. (2019) explored the potential interrelationship between venture capital investment, ICT (Information and Communication Technology) infrastructure, and economic growth across 25 European countries over the period from 1989 to 2016. Applying the error correction model along with the Granger causality test, their study uncovered bidirectional causal relationships among the variablesvindicating that venture capital investment and ICT infrastructure influence one another. The findings revealed that ICT infrastructure plays a critical role in every phase of venture capital investment, from the early to the late stages. According to the Supply Leading Hypothesis, a significant portion of venture capital is funneled into the ICT sector due to its high potential for returns. Supporting this, data from the OECD (2017) shows that in 2016, approximately 53.6% of venture capital investments in the United States and around 44% in Europe were allocated to the ICT sector. These insights highlight the strong link between venture capital and ICT development. Based on this evidence, the following hypothesis was proposed:

Hypothesis 5: Venture capital has a positive and significant influence on the use of internet technology.

Relationship between the Use of Internet Technology and Growth

Akomea-Bonsu and Sampong (2012) investigated the impact of ICT adoption on SMEs in the Kumasi Metropolis and found that ICT implementation enhances productivity and contributes significantly to business growth. The study highlighted that internet use has transformed business practices, allowing SMEs to secure more contracts and expand their market reach. The internet is mainly utilized for identifying customer locations, managing contracts, conducting online business activities, and email communicationvrather than for sourcing raw materials. These findings suggest that ICT adoption has a positive effect on industrial performance.

Similarly, Tarutė and Gatautis (2014) analyzed the direct and indirect effects of ICT on SMEs' success and performance. Their study found that ICT strengthens both internal and external communication and enhances overall performance, especially when ICT investments align with internal organizational capabilities and processes. Onileowo and Fasiku (2021) further emphasized the critical role of SMEs in national economic growth, particularly in Nigeria, and the importance of ICT in improving SME performance. Their research revealed that many SME owners tend to operate domestically with limited digital outreach, highlighting the need for global business integration through ICT to support economic expansion. This study also identifies key challenges limiting the effective use of ICT and calls for the integration of ICT into business operations, along with the provision of training programs and support infrastructure. It underscores the need for Micro and Small Industries (MSIs) to actively adopt ICT by leveraging digital resources, networks, and consumer engagement tools. Entrepreneurs are encouraged to become more digitally proficient to optimize efficiency and productivity. Based on these findings, the following hypothesis is proposed:

Hypothesis 6: The use of internet technology has a positive and significant influence on growth.

Mediating Role of Internet Technology

Previous studies suggest that internet technology plays a mediating role in the relationship between venture capital and company growth. Pradhan et al. (2019) demonstrated that venture capital significantly influences the adoption of internet technology, while Onileowo and Fasiku (2021) confirmed that internet technology has a meaningful impact on business growth. These findings imply that venture capital may enhance company growth indirectly through the promotion of internet technology usage. Accordingly, the following hypothesis is proposed:

Hypothesis 7: Venture capital has a positive and significant influence on growth through the use of internet technology.

In the context of this study, the manufacturing industry within the micro and small-scale sectors is defined based on BPS (2019) as activities that transform raw or basic materials into semi-finished or finished products, thereby adding value. The classification distinguishes between micro industries employing 1 to 4 workers and

small industriesvemploying between 5 and 19 workers. These sectors include a wide range of activities such as food and beverage processing, textiles, printing, pharmaceuticals, chemicals, wood products, rubber, and more. Micro and small industries are subsets of the broader category of micro, small, and medium enterprises (MSMEs).

Legally, micro enterprises are defined as businesses with a net worth of up to IDR 50 million, excluding the value of land and buildings used for business, or with annual sales of no more than IDR 300 million. Small enterprises, on the other hand, have a net worth ranging from IDR 50 million to IDR 500 million and annual revenues of more than IDR 300 million but not exceeding IDR 2.5 billion (Republik Indonesia, 2008).

This research is grounded in the theory of company growth, which views growth as a dynamic process where a company evolves from a smaller, less competitive entity into a larger, more robust one capable of sustaining itself in a competitive market. According to Penrose (2009) defines growth not only as an increase in company size but also as a continuous process of improvement and transformation. In this study, company growth is measured using employee growth as a key performance indicator.

This research focuses on analyzing the influence of venture capital, innovation, and the use of internet technology on company growth. Specifically, it examines both the direct and indirect impacts of venture capital in fostering growth. The relationships among these variables are illustrated in Figure 1.

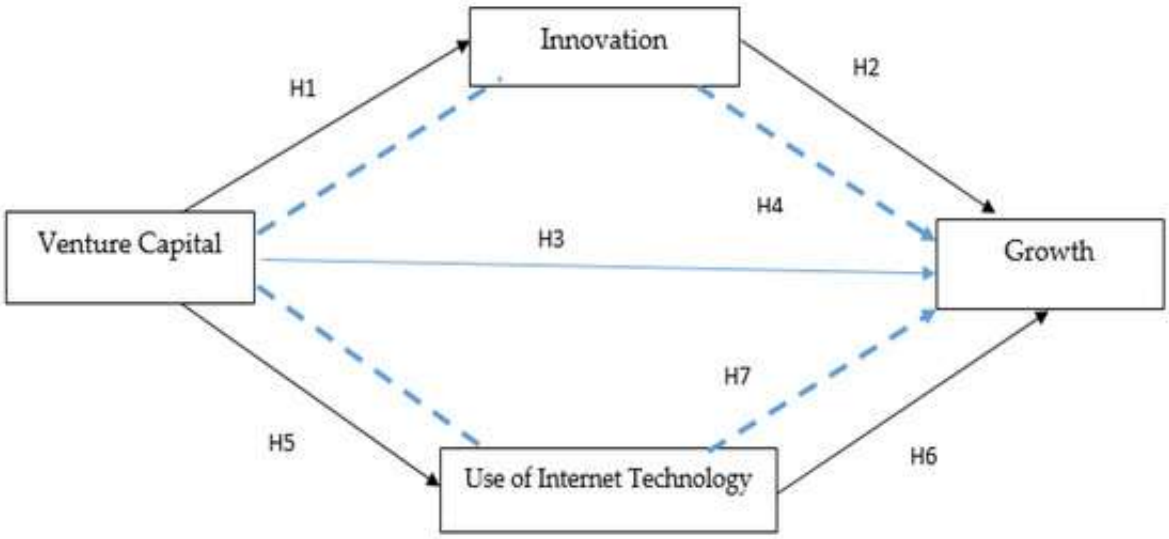


Figure 1. Research framework and relationship between constructs.

3. | RESEARCH METHOD

This study utilized secondary data obtained from the 2019 survey conducted by BPS. The total population of Micro and Small Industries (MSIs) in that year was 4,380,176, comprising 4,174,108 micro industries and 253,068 small industries (BPS, 2022). The sampling method employed was Two-Stage Stratified Cluster Sampling, with sample selection carried out using the Systematic Probability Proportional to Size (PPS)

technique. This technique relied on data from the 2016 Economic Census registration, incorporating implicit stratification based on whether industries were located in industrial centers or non-industrial areas.

The study targeted Micro and Small Industries (MSIs) employing fewer than 20 workers, as registered with district and municipal governments across Indonesia. From the initial sample of 90,295 MSIs that met the inclusion criteria, 6,679 observations were excluded due to missing data, particularly related to the number of employees and venture capital usage. The final sample consisted of 83,616 MSIs.

Unlike studies by Biney (2018) and Du and Cai (2020), which focused on Small and Medium Enterprises (SMEs), this study exclusively analyzed MSIs. To examine the direct effects, logistic regression analysis was conducted using STATA, while the Sobel test was applied to assess indirect effects. Growth was measured using a dummy variable, where a score of 1 indicated an increase in the number of employees, and a score of 0 represented a decline consistent with the approach used by Haynes and Brown (2009) and Bui et al. (2021). In contrast, studies by Biney (2018), Peneder (2010), and Du and Cai (2020) utilized ratios reflecting year-over-year changes in employment, total assets, and sales.

The venture capital variable was operationalized similarly to prior studies (e.g., Biney, 2018; Peneder, 2010), using a dummy variable with a value of 1 for MSIs that received venture capital and 0 for those that did not. The innovation variable was represented by trademark ownership, differing from Peneder (2010), who used patent counts. The use of internet technology was also captured via a dummy variable: MSIs using the internet were coded as 1, and those not using it were coded as 0.

Unlike Pradhan et al. (2020), who relied on macro-level data, this study used micro-level data collected through a cross-sectional design in 2019. Furthermore, while Biney (2018) employed primary data via surveys and used control variables within the propensity score matching method, the current study did not include control variables. Instead, it analyzed intervening variables namely, innovation and internet technology usage to evaluate the mediating effect of venture capital on growth.

A summary of the variables used in this study is presented in Table 1.

Table 1. Symbol and description of variables.

No	Symbol		Description	Variable
1	GRW	Growth	Ratio of increase in workers of current period and prior to current period, Dummy = 1 if the ratio > 0 and 0 = if the ratio ≤ 0.	Dependent
2	VC	Venture Capital	Dummy 1 = if venture capital was used and 0 = if venture capital was not used.	Independent
3	INT	Use of Internet Technology	Dummy = 1 if uses the internet, 0 = if does not use the Internet.	Intervening

No	Symbol		Description	Variable
4	INV	Innovation	Dummy 1 = if trademark was available, 0 = if trademark was unavailable.	Intervening

Model

Propensity Score Matching (PSM) was applied in previous studies by Biney (2018), Peneder (2010), and Engel and Keilbach (2007) to address counterfactual problems and selection bias, which could potentially distort causal inferences. These studies ensured comparability between treatment and control groups by matching firms that received venture capital with similar firms that did not. Additionally, they employed survey-based data collection using questionnaires, enabling them to gather detailed information on company performance before and after receiving venture capital. This allowed them to apply the Difference-in-Differences (DiD) approach to assess the causal effect of venture capital financing.

In contrast, the present study did not utilize PSM or DiD methods, as it relies exclusively on secondary cross-sectional data and does not measure firm growth before and after venture capital financing. Instead, this research applies logistic regression analysis to test the direct effect of venture capital on company growth, given that both the dependent and independent variables are represented as dummy variables. To ensure the validity of the logistic regression results and minimize potential estimation bias, a robustness test was also conducted.

Furthermore, this study differs from those by Biney (2018), Peneder (2010), and Engel and Keilbach (2007) in terms of model structure, as it introduces intervening variables namely innovation and internet technology use—to analyze the indirect effects of venture capital on company growth. These mediating relationships were tested using the Sobel test. The direct relationship between venture capital and the growth of Micro and Small Industries (MSIs) in Indonesia was analyzed using logistic regression, while the indirect effects through innovation and internet technology were examined using mediation analysis. The logistic regression model used in this study is as follows:

$$\ln \frac{\mathrm{INV}}{1-\mathrm{INV}} = 0\mathrm{i} + \mathrm{b}_1\mathrm{VC}_1 + \mathrm{e} \quad (1)$$

$$\ln \frac{\mathrm{GRW}}{1-\mathrm{GRW}} = 0\mathrm{i} + \mathrm{b}_1\mathrm{VC}_1 + \mathrm{b}_2\mathrm{INV}_{2\mathrm{l}} + \mathrm{e} \quad (2)$$

$$\ln \frac{\mathrm{INT}}{1-\mathrm{INT}} = 01 + \mathrm{b}_1\mathrm{VC}_{1\mathrm{l}} + \mathrm{e} \quad (3)$$

$$\ln \frac{\mathrm{GRW}}{1-\mathrm{GRW}} = 01 + \mathrm{b}_1\mathrm{VC}_{11} + \mathrm{b}_2\mathrm{INT}_{21} + \mathrm{e}. \quad (4)$$

GRW = Growth.

INV = Innovation.

VC = Venture capital.

INT = Use of internet technology.

4. | RESULTS

Descriptive Statistics

The descriptive statistics indicate that the minimum and maximum values for each of the key variables venture capital, use of internet technology, innovation, and growth are 0 and 1, respectively. This is consistent with the use of dummy variables to represent these constructs. For detailed information, refer to Table 2 below.

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
VC	83.616	0.006183	0.0783892	0	1
INT	83.616	0.1546714	0.3615933	0	1
INV	83.616	0.0252105	0.1567648	0	1
GRW	83.616	0.0401359	0.196279	0	1

Note: This table is the descriptive statistic of the dependent, independent, and intervening variables in Micro and Small Industries (MSIs) in Indonesia in 2019.

Logistic Regression Results

In contrast to Peneder (2010) and Biney (2018), who employed propensity score matching (PSM), this study utilized logistic regression to test the proposed hypotheses following a robustness check. The results of the logistic regression analysis are presented in Table 3 below.

Table 3. Logistic regression after robustness test

Variable		INV (1)	GRW (2)	INT (3)	GRW (4)
VC	Coefficient	0.4968	0.1082	0.0588	0.1037
	Odds Ratio	1.6435	1.1143	1.0606	1.1092
	p-value	0.0260 *	0.6130	0.6230	0.6290
INV	Coefficient		0.5082		
	Odds Ratio		1.6630		
	p-value		0.0000 **		
INT	Coefficient				0.5164
	Odds Ratio				1.6759
	p-value				0.0000 **
Constanta		0.0258	0.4112	0.1829	0.0379
R2		0.0002	0.0010	0.0000	0.0049
N		83,616	83,616	83,616	83,616

Note. The influence of venture capital on internet use, innovation, and the growth of Micro and Small Industries (MSIs) was tested using a logistic regression test. The sample included

(N) 83,616 Micro and Small Industries (MSIs) in 2019. Significance Level 5%, 1%**. The data were collected from the survey by Badan Pusat Statistik (BPS).*

This study employed dummy variables for all independent, intervening, and dependent variables. The results from Model 1, using simple logistic regression to assess the influence of venture capital on innovation, indicate a positive and significant effect with a p-value of 0.0260 < 0.05. The odds ratio (OR) of 1.6435 suggests that Micro and Small Industries (MSIs) utilizing venture capital are 1.6435 times more likely to be innovative than those that do not. Therefore, Hypothesis 1 is accepted.

Model 2, using multiple logistic regression to examine the effects of innovation and venture capital on growth, found that innovation has a positive and significant effect on growth with a p-value of 0.000 < 0.05. The OR of 1.6624 implies that innovative MSIs are 1.6624 times more likely to experience growth than non-innovative ones, supporting Hypothesis 2. In contrast, venture capital showed a positive but insignificant effect on growth (p = 0.6130 > 0.05, OR = 1.1143), leading to the rejection of Hypothesis 3.

Model 3, using simple logistic regression to assess the effect of venture capital on internet technology use, revealed a positive but insignificant relationship (p = 0.6230 > 0.05, OR = 1.0606), indicating that venture-backed MSIs are only marginally more likely to use internet technology, and this difference is not statistically significant. Thus, Hypothesis 5 is rejected.

Model 4, which employed multiple logistic regression to evaluate the impact of internet technology on growth, showed a positive and significant influence (p = 0.000, OR = 1.6759). This suggests that MSIs using internet technology are 1.6759 times more likely to grow than those not using it, confirming Hypothesis 6. Meanwhile, venture capital again exhibited a positive but insignificant effect on growth (p = 0.6290, OR = 1.1092), reinforcing the earlier rejection of Hypothesis 3.

Mediating Effect Test Result

To assess the mediating role of innovation in the relationship between venture capital and the growth of Indonesian Micro and Small Industries (MSIs), this study employed the Sobel test (Sobel, 1982). The Sobel test is used to determine whether the indirect effect of an independent variable (X) on a dependent variable (Y) through a mediating variable (M) is statistically significant (Preacher & Leonardelli, 2001).

As shown in Table 4, the Sobel test yields a p-value of 0.0395, which is less than the significance threshold of 0.05. This result indicates that innovation significantly mediates the effect of venture capital on MSI growth. In other words, Indonesian MSIs that utilize venture capital as a financing source experience growth that is significantly influenced by their level of innovation. Therefore, Hypothesis 4 is accepted.

Table 4. Sobel test results with innovation as a mediating variable.

	Input		Test Statistic	Std. Error	*p*-Value
A	0.4968	Sobel test	2.05833633	0.12159715	0.03955786

B	0.5038
Sa	0.2239
Sb	0.0914

Table 5 presents the Sobel test results with the use of internet technology as a mediating variable. The p-value obtained from the Sobel test is 0.6232, which is greater than the 0.05 significance level. This indicates that the use of internet technology does not significantly mediate the relationship between venture capital and the growth of Indonesian Micro and Small Industries (MSIs). Consequently, internet technology cannot be considered a mediator for the effect of venture capital on MSI growth. Therefore, Hypothesis 7 is rejected.

Table 5. Sobel test results with the use of internet technology as a mediating variable.

	Input		**Test Statistic**	**Std. Error**	***p*-Value**
A	0.0588	Sobel Test	0.49123642	0.06148885	0.62325924
B	0.5137				
Sa	0.1196				
Sb	0.0423				

Hypothesis Test Result

Table 6 summarizes the statistical test results indicating that innovation significantly mediates the influence of venture capital on the growth of Indonesian Micro and Small Industries (MSIs). In contrast, the use of internet technology does not mediate the effect of venture capital on MSI growth. Furthermore, venture capital does not have a direct significant impact on the development of Micro and Small Industries in Indonesia.

Table 6. Hypotheses result test.

Hypotheses		***p*-Value**	**Result**
H1	VC → INV	0.026 **	Significantly Positive
H2	INV → GRW	0.000 ***	Significantly Positive
H3	VC → GRW	0.6130	Insignificantly Positive
H4	VC → INV → GRW	0.039 **	Significantly Positive
H5	VC → INT	0.6230	Insignificantly Positive
H6	INT → GRW	0.000 ***	Significantly Positive
H7	VC → INT → GRW	0.640	Insignificantly Positive

*Note the sig value ** with a p-value < 0.05 (5%), while *** a significant value < 0.01 (1%).*

5. | DISCUSSION

This study examines the direct and indirect influence of venture capital on the growth of Indonesian Micro and Small Industries (MSIs). The first hypothesis posits that

venture capital positively influences innovation activities in MSIs. The statistical results support this, showing a significant positive effect. This finding aligns with Peneder (2010), who noted that firms using venture capital tend to introduce new products, protect innovations via intellectual property rights, and generally achieve better innovation performance. Venture capital financing enables innovative companies, often constrained by traditional credit channels, to manage more professionally and accelerate product market introduction, thus boosting growth and innovation market share (Hellmann and Puri 2000). Pradhan et al. (2020) also highlight that acquiring risky capital through venture capital enhances translational and applied research. Research by Pradhan et al. (2018) employing various innovation proxies patents, trademarks, R&D supports this. Similarly, Kortum and Lerner (2000) and Faria and Barbosa (2014) found venture capital positively impacts innovation and competitiveness across different regions, including Europe. In Indonesia, venture capital evidently facilitates innovation in MSIs, notably in trademark creation.

The second hypothesis, stating that innovation positively influences MSI growth, is also supported. This result aligns with Adam and Alarifi (2021), who found that innovation practices significantly improve SME performance and survival in Saudi Arabia. It also supports Freeman's (2004) view that managerial innovation boosts firm performance. Gohar et al. (2020) emphasize how setting innovation goals enhances company performance, while Hall et al. (2009) show innovation's positive impact on SME productivity. Mwangi and Namusonge (2014) further confirm innovation's role in fostering SME growth in manufacturing.

Conversely, the third hypothesis venture capital's direct influence on MSI growt is not supported. Venture capital does not significantly affect Indonesian MSI growth, contrasting with findings by Biney (2018), Engel (2002), Peneder (2010), Belke et al. (2003), Bertoni et al. (2011), and Mirza and Sabah (2018), who report positive effects on company growth, particularly employee expansion. Peneder (2010) attributes such growth to venture capital's screening and monitoring functions. The absence of a significant effect in Indonesia may be due to the underdeveloped venture capital market and suboptimal functioning, as suggested by the decline in venture capital investments reported by the Financial Services Authority (OJK) from 2015 to 2020 (Sofia et al. 2021).

The fourth hypothesis that innovation mediates the relationship between venture capital and MSI growth is confirmed by the data, indicating that venture capital contributes to growth indirectly through innovation. The fifth hypothesis explores whether venture capital influences MSIs' use of internet technology. The findings show no significant effect, which contrasts with OECD (2017), who argue that venture capital investments in the ICT sector drive higher investment levels. Regarding the sixth hypothesis, the study confirms that internet technology usage positively and significantly influences MSI growth. This supports Onileowo and Fasiku's (2021) view

that ICT enhances productivity and efficiency by lowering processing costs, overcoming geographical barriers, and enabling broader operational reach.

Finally, the seventh hypothesis tests whether internet technology mediates the relationship between venture capital and MSI growth. The results show this mediation is insignificant, meaning internet use does not facilitate venture capital's impact on growth. In summary, venture capital alone does not directly spur the growth of Indonesian MSIs. However, it indirectly promotes growth by fostering innovation, while internet technology use does not serve as a mediating channel. Peneder (2010) suggests venture capital complements rather than substitutes internal financing, which may explain why venture capital's direct effect on growth is limited. These findings provide valuable insights for policymakers and practitioners in developing economies seeking to leverage venture capital and innovation for SME growth.

Managerial and Theoretical Implications

The findings of this study provide meaningful contributions to owners of Micro and Small Industries (MSIs) in Indonesia, particularly those who utilize venture capital as part of their financing structure. The results demonstrate that while venture capital may not directly accelerate MSI growth, it plays a pivotal role in fostering innovation, which in turn contributes significantly to growth. This relationship suggests that both the financial resources and the strategic, non-financial support offered by venture capital such as mentorship and professional guidance can facilitate the creation of innovative products and processes that align with business objectives and drive expansion.

Although the adoption of venture capital among Indonesian MSIs remains relatively limited, the evidence indicates that its presence can yield substantial benefits when paired with a strong emphasis on innovation. Recognizing this potential, the government has begun to acknowledge the strategic importance of venture capital and innovation in accelerating the growth of small-scale industries. As awareness increases, MSIs are better positioned to take advantage of venture capital institutions, not only as a source of funding but also as catalysts for long-term development.

On a theoretical level, this study extends the traditional understanding of business growth by showing that it is not solely determined by access to capital but also by the innovative capacity enabled by that capital. The research highlights that innovation serves as a crucial mediating factor in the relationship between venture capital and enterprise growth. Moreover, the findings emphasize the role of internet technology as a modern tool for business development, although its mediation effect remains less pronounced. This study is among the first to integrate venture capital, innovation, internet technology, and business growth within a single empirical framework, using a dummy variable approach for the growth indicator. This novel integration addresses gaps left by previous studies and opens avenues for future research to explore additional mediating variables and more diverse metrics. In doing so, it advances both scholarly understanding and practical applications of venture capital's role in the development of micro and small businesses in emerging economies.

6. | CONCLUSION

This study aimed to investigate the influence of venture capital on the growth of Micro and Small Industries (MSIs) in Indonesia, with a particular focus on the mediating roles of innovation and internet technology. The results of the analysis reveal several important insights. First, venture capital has a positive and significant effect on innovation (H1), and innovation, in turn, significantly contributes to the growth of MSIs (H2). However, venture capital does not have a direct impact on MSI growth (H3). Instead, its influence is realized indirectly through innovation, which serves as an effective mediating variable (H4).

On the other hand, the study finds that venture capital does not significantly influence the use of internet technology (H5). Despite this, the use of internet technology has a positive and significant effect on MSI growth (H6). Nevertheless, internet technology does not mediate the relationship between venture capital and business growth (H7). In summary, venture capital presents a viable financing solution for MSIs, particularly those constrained by limited access to traditional credit. By enabling more professional management practices and fostering innovation, venture capital indirectly contributes to business growth. The study reinforces the notion that innovation acts as a critical link between venture capital and enterprise development. Although venture capital does not enhance the adoption of internet technology, digital tools themselves remain important for growth.

The study also acknowledges several limitations. First, it focuses solely on the financial dimension of venture capital, without delving into its non-financial contributions such as managerial expertise, networking, or mentorship. Second, the research relies on secondary data sourced from *Badan Pusat Statistik (*BPS), which limits the depth of insights that could be gained from more nuanced, primary data collection. Third, the study uses a narrow growth proxy based on the change in employee numbers over a two-year period, which may not fully capture the complexities of business expansion. Future research is encouraged to explore alternative growth indicators, consider longer observation periods, and examine other potential mediating variables. Additionally, greater emphasis on primary data collection could provide a more comprehensive understanding of the mechanisms through which venture capital influences MSI development.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest.

Ethical Approval and Originality Statement

Ethical approval was obtained for this study. The manuscript represents original work and has not been previously published, nor is it under consideration by another journal.

Data Disclosure Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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