The Indirect Effects of Firm Size and Financial Structure on Firm Performance through Investments in Human Capital Development

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Abstract

This research aims to examine the indirect relationship between firm size and financial structure on business performance through investments in human capital development. The study utilized data from companies listed on the Stock Exchange of Thailand for the years 2021-2022, sourced from financial statements and the "56-1 One Report" within the SETSMART database. Companies with incomplete financial statement data and those in the rehabilitation group were excluded, resulting in a total sample size of 892 observations. Path analysis was employed to test the relationships. The results revealed that larger firms exhibited a positive indirect relationship with firm performance through investments in human capital development. Similarly, companies with a financial structure characterized by debt-to-equity demonstrated a positive indirect relationship with firm performance via investments in human capital development. Furthermore, the findings indicated that debt-to-equity had a direct relationship with firm performance, whereas no direct relationship was found between firm size and firm performance.

Keywords: Firm Size, Financial Structure, Investment in Human Capital Development, Firm Performance

Introduction

Between 2020 and 2022, companies listed on the Stock Exchange of Thailand faced the crisis caused by the COVID-19 pandemic. Most companies experienced a decline in performance during this period, which also marked an acceleration in the development of work processes

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through the use of information technology, enabling businesses to operate under the constraints imposed by the situation. Some companies listed on the Stock Exchange of Thailand invested in artificial intelligence (AI) and incurred expenses to enhance their employees' skills, knowledge, and expertise to adapt to new work processes. A noteworthy expense reflected in the financial reports of these companies during this crisis was employee training costs. This research uses such expenses as a representation of investments in human capital development.

Previous studies have directly examined the relationship between firm size and firm performance, but the findings are mixed. Some studies report a positive association—arguing that large firms benefit from economies of scale and therefore can generate higher profits—while others find no significant relationship, and still others report negative effects of size on performance (Strecker, 2009; Meiryani, Olivia, Sudrajat, & Daud, 2020). Large firms may enjoy competitive advantages arising from greater resources, yet in certain circumstances they face higher exposure to errors and inefficiencies, which can offset those advantages and reduce profitability relative to smaller firms. Given mixed empirical findings on the size–performance relationship, it is important to determine whether the competitive advantages of larger firms translate into higher profitability across contexts. This study examines firms' investments in human capital development — particularly during the COVID-19 crisis—to assess whether larger firms enhance performance by increasing investment in human capital development. Drawing on signaling theory, firms are expected to use such investments to signal to stakeholders that they are adapting and improving internal capabilities during a crisis, thereby enhancing credibility. Because signaling via investment in human capital development is costly, larger firms are more likely to report higher levels of such investment than smaller firms.

Previous research has shown that larger firms tend to invest more in human capital development (Waddoups, 2011), that firm size is positively associated with performance in some settings (Dogan, 2013), and that investment in human capital development is positively related to firm performance (Chen, 2020). However, there remains limited evidence on whether large firms specifically employ human capital investment as a mechanism to improve performance to a greater extent than small firms. This constitutes the first research gap addressed in the present study.

During the COVID-19 crisis, some firms increased long-term debt to finance operational adjustments and strategic investments, including investments in human capital

development. Although higher leverage can signal growth opportunities to investors, it also raises interest obligations and can depress accounting profits. Prior studies report a negative direct association between debt levels and firm performance (Grossman & Livingstone, 2009; Zhang, Hu, & Luo, 2020). Nonetheless, some firms incur long-term debt despite potential short-term profit pressures, using the funds to expand human capital investment and to signal future operational capability and debt-servicing capacity. Whether firms use human capital investment to offset or mediate the negative performance consequences of increased long-term debt remains an open question—this is the second research gap motivating the study.

Motivated by these gaps, the study investigates whether (1) larger listed firms in Thailand are more likely than smaller firms to use investments in human capital development as a tool to enhance performance, and (2) firms that increase long-term debt employ investments in human capital development to mitigate the adverse short-term performance effects of higher leverage. These relationships are tested by examining the indirect effects of firm size and long-term debt on firm performance via investments in human capital development.

Investments in human capital are expected to increase employee productivity and, consequently, firm profitability. This effect is particularly salient for larger firms with complex operations and diverse activities. To reassure external stakeholders about workforce effectiveness, firms commonly disclose training and related expenditures as a signal of commitment to human capital development. Such investments improve employees' skills, knowledge, and expertise and, therefore, are expected to have a positive impact on firm performance (Lee, 2009).

Accordingly, this study examines the following relationships: (1) firm size and investments in human capital development; (2) financial structure (debt-to-equity ratio) and investments in human capital development; and (3) investments in human capital development and organizational performance. The study also investigates whether firm size and financial structure affect firm performance indirectly through investments in human capital, using data collected during the COVID-19 crisis (2021–2022). If such indirect relationships are observed, this would indicate that firms taking on additional long-term debt should plan human capital investments to prepare for new projects and to help ensure sufficient profitability to service interest and principal. Likewise, firms expanding in size should allocate resources to human capital development so their workforce can operate efficiently and contribute to improved performance.

Research Objectives

The objectives of this research are:

1. To examine the indirect relationship between firm size and firm performance through investments in human capital development.

2. To examine the indirect relationship between financial structure and firm performance through investments in human capital development

Literature Reviews

Human Capital Theory

Human capital theory, a foundational concept in the economics literature (Becker, 1964; Becker,1996), conceptualizes people as vital assets of the firm. Human capital differs from physical and financial capital: it is an intangible asset whose value derives from knowledge, skills, experience, and health, and which generates added value for the organization. The concept of human capital development encompasses intellectual, social, and emotional capital (Pakaut, 2020). For the purposes of this study, however, "human capital development" refers specifically to the development of intellectual capital, which emphasizes knowledge, specialized skills, learning, accumulated experience, and individual health (Becker, 2002).

Human capital development consists of structured learning and experiential processes intended to strengthen job-related skills and competencies (Noe, 2017; Whitehead, 2022). In this research, investment in human capital development is operationalized as spending on employee training as reported in firms' financial statements. Providing training opportunities enables employees to acquire and apply enhanced capabilities, which improves individual performance and, consequently, organizational effectiveness. Well-trained employees are generally more efficient and productive than their less trained counterparts (Osiobe, 2019), and skill development has been shown to create added value in organizational outputs (Khalique, Shaari, Ageel, & Isa, 2011; Chen, 2020).

A key managerial focus is human skills: personnel require ongoing development of knowledge, information, innovation, and creative thinking to improve work performance, customer satisfaction, and competitive advantage. This objective aligns with Cole's (2002) characterization of training as the development of learning tools to acquire job-specific knowledge and skills.

Investment in human capital fosters an organizational environment of continuous learning, enhances employee motivation, and increases competitive advantage (Sung & Choi, 2018). Firms that allocate resources to internal training programs can more rapidly build organization-specific human capital (Hewett, Shantz, Mundy, & Alfes, 2018).

Motivation Theory

Maslow's Hierarchy of Needs (1970) is a widely recognized framework that orders human needs from basic to higher-level requirements. The theory proposes that individuals are motivated by unmet needs and that, as lower-level needs are satisfied, attention shifts toward higher-level needs. In organizational settings, this progression implies that when employees' basic needs are met, they increasingly seek opportunities for personal and professional growth.

Motivation theory thus complements human capital theory: training and development satisfy employees' higher-order needs for growth, esteem, and self-actualization, which in turn stimulates motivation. Employees who receive training anticipate greater job security and career advancement; the fulfillment of these developmental needs promotes personal growth and aligns with employees' professional aspirations.

Consequently, training operates not only as a capability-building mechanism but also as a non-monetary reward that enhances motivation, effort, and commitment. By fostering a sense of job security and prospective advancement, investments in human capital development can increase employee effort and productivity, thereby improving organizational performance (Datrika, Huggahalli, & David, 2021; Ruth, Noch, & Khotimah, 2024).

Signaling Theory

Signaling theory explains how parties with asymmetric information communicate: the informed party (the sender) chooses whether and how to convey information, while the uninformed party (the receiver) decides how to interpret that signal. The theory is widely applied in management disciplines—including strategic management, entrepreneurship, and human resource management—because it helps address the information gap between firm insiders (e.g., executives and board members) and external stakeholders (e.g., investors) who lack comparable knowledge about the firm's current condition and prospects (Connelly, Certo, Ireland, & Reutzel, 2011).

A central function of signaling in organizational contexts is to communicate management's success or corrective actions to owners and the market. Firms that proactively

disclose positive information can distinguish themselves from less successful peers and thereby enhance market trust, whereas firms with weak historical performance may find it difficult to gain investor confidence (Wolk & Tearney, 1997). Signals may be observable actions or disclosures that are immediately apparent to outsiders, or they may be subtler indicators that require analysis to interpret. For a signal to be effective it must carry credible information that can influence external assessments of the firm's quality.

Because low-quality firms could mimic inexpensive signals, credible signaling often involves costs that only higher-quality or better-capitalized firms can bear. Akerlof (1970) argued that high-quality firms should use signals that reliably reflect their superiority and serve to differentiate them from lower-quality competitors. In practice, costly signals—such as substantial investments in human capital, R&D, or long-term projects—are therefore more likely to be interpreted by the market as evidence of genuine quality or commitment.

Firm Size and Investment in Human Capital Development

Broad information disclosure functions as a positive signal to investors: the more transparently a firm communicates with stakeholders, the greater the stakeholders' understanding and trust, which can translate into higher product engagement and improved financial returns (e.g., ROE). In this study, employee training expenditures are treated as a signaling mechanism—public investment in training signals management's commitment to strengthening workforce skills and operational quality. Because such signals must be credible, firms that incur substantial training costs demonstrate a willingness and capacity to invest in high-quality, efficient work processes.

Larger firms, owing to more complex operations and a greater proportion of operationally skilled personnel, are generally better able to absorb the cost of extensive training programs than smaller firms. Empirical evidence supports this pattern: smaller organizations typically provide less training—especially in practical areas such as health and safety, management, and technical skills (Waddoups, 2011; Osterman, 1995)—while larger firms record higher levels of employee training (Black, Noel, & Wang, 1999). From a signaling perspective, Akerlof's (1970) logic implies that higher-quality firms use costly, observable signals to differentiate themselves; large firms with cost advantages are therefore more likely to use training expenditures to signal quality and build investor confidence.

Accordingly, this study posits that firm size is positively associated with investment in human capital development: larger firms are more likely than smaller firms to invest substantially in employee training as a credible signal of operational quality and future performance.

Long-Term Debt-to-Equity and Investment in Human Capital Development

Long-term debt-to-equity (D/E) signals a firm's commitment to future obligations and long-term projects. Firms that increase long-term leverage typically undertake projects that require operational adjustments; investing in employee skills and knowledge reduces operational risk and demonstrates preparedness to investors. Consequently, training expenditures serve both a practical role—improving employees' ability to execute new or changed processes—and a signaling role—conveying management's capacity and intent to fulfill long-term commitments.

In this study, training expenditures are treated as investments in human capital (an indirect cost of capability building) that enhance workforce efficiency and organizational performance. Although higher leverage raises interest obligations and can depress short-term accounting profits, firms that finance long-term initiatives with debt may concurrently increase investments in human capital to safeguard project execution and future profitability. Prior work characterizes such training as an investment in employee potential and organizational adaptability (Srichada & Chaisaengpratheep, 2018).

Accordingly, this research investigates whether firms with higher D/E ratios exhibit greater investment in human capital development (measured by training expenditure) and whether such investments mediate the effect of financial structure on firm performance.

Economies of Scale: **Firm Size and Firm Performance**

Previous research examining the relationship between firm size and profitability has produced mixed results. Several studies report a positive relationship, arguing that larger firms benefit from economies of scale and greater credibility, which enable them to generate higher profits (Fiegenbaum & Karnani, 1991; Lee, 2009; Dogan, 2013). Other studies report a negative relationship, suggesting that larger firms face higher external monitoring and regulatory costs and tend to hold more assets, which can depress returns on assets relative to smaller firms (Schneider, 1991; Becker-Blease, Karen, Etebari, & Baumann, 2010). A third group of studies finds no systematic relationship between size and performance, attributing the heterogeneity of results to

differences in industry context, organizational structure, and corporate culture (Whittington, 1980; Velnampy & Nimalathasan, 2010).

Given these mixed findings, this study emphasizes firms' investments in human capital as a potential mechanism linking size to performance. Specifically, larger firms are expected to communicate greater investment in human capital development (for example, training expenditures) to signal organizational quality, enhance reputation, and strengthen stakeholder confidence.

Accounting Effect of Long-term Debt on Firm Performance

Firms often increase long-term debt to finance new projects; while such leverage signals growth opportunities, it also creates interest and principal repayment obligations that reduce accounting profits. Because debt carries ongoing costs, higher leverage is generally associated with lower measured profitability, and highly profitable firms tend to exhibit lower debt levels. Empirical studies have reported a negative relationship between long- term debt and firm performance (Ebaid, 2009; Zhang et al., 2020).

Based on the foregoing theoretical and empirical considerations, the following research hypotheses are developed.

Hypothesis Development

The size of a business reflects the complexity of its internal operations. Larger companies tend to have more complex tasks. During the changes in the work environment brought about by the COVID-19 crisis, these companies were required to adapt their working methods by investing in employee training to ensure that they could operate sustainably even during challenging times. In such situations, information asymmetry arises between internal stakeholders and external parties. Therefore, companies must instill confidence in their operations among external stakeholders by disclosing information about their successes to signal their management status to investors. According to signaling theory (Wolk & Tearney, 1997), larger firms exhibit greater process complexity and a broader scope of operations, often employing a higher number of employees, most of whom have educational backgrounds below the tertiary level. In contrast, smaller companies, which tend to have fewer employees and less diverse operations, generally employ a workforce with higher educational qualifications. Consequently, larger firms prioritize

training and knowledge development for their employees more than smaller firms do, as they rely more heavily on employees with practical skills rather than cognitive skills (Waddoups, 2011). Consequently, larger firms have a greater capacity to incur expenses related to investments in human capital development, as reflected in their financial statements, compared to smaller firms. This effective communication fosters investor confidence in the company's ability to develop efficient operational processes, which are often superior to those of smaller firms. As a result, larger enterprises tend to invest more in human capital development than their smaller counterparts.

Organizations that make substantial investments in human capital development—primarily through employee training—tend to realize improvements in employee performance as staff acquire greater knowledge and skills (Chen, 2020). These investments also promote job security by creating a work environment that supports effective performance, functioning as a non-monetary form of compensation (Ruth et al., 2024). According to motivation theory, individuals who expect job security and seek to retain their positions are more likely to exert effort at work, and these individual efforts contribute to the firm's overall performance. Complementing this, human capital theory posits that enhancing employees' knowledge and job-related skills increases their effectiveness and, consequently, improves organizational outcomes (Datrika et al., 2021).

Given the foregoing, larger firms are more likely than smaller firms to signal substantial investment in human capital because they face greater task complexity and employ more personnel. Signaling theory explains why larger firms disclose higher training expenditures to demonstrate capability and commitment. Motivation and human capital theories together suggest that employees who receive skills development perceive greater career advancement and job security, which increases effort and improves organizational performance. Therefore, firm size is expected to enhance firm performance indirectly through increased investment in human capital development. Based on these theoretical and empirical considerations, the following research hypothesis is proposed:

H1: Firm size has a positive indirect impact on firm performance through investments in human capital development.

In addition to firm size, financial structure is expected to influence organizational performance. Financial structure, measured by the long-term debt-to-equity ratio, indicates the extent to which firms finance operations with long-term debt versus equity. Higher long-term leverage creates obligations for interest and principal repayments, which can depress net profits (Grossman & Livingstone, 2009; Zhang et al., 2020). During the COVID-19 crisis, firms with elevated long-term debt were particularly visible to financial markets and stakeholders. Under signaling theory, such firms have an incentive to demonstrate credibility by communicating their operational readiness and future plans; one common approach is to disclose and increase investments in human capital development to show preparedness for long-term projects and anticipated returns (Bird & Smith, 2005). Large training expenditures therefore serve as a costly, credible signal that management is mitigating the operational risks associated with long-term commitments.

Motivation theory further explains the mechanism linking human capital investment to performance: training functions as an incentive that encourages employees to acquire and apply knowledge, improving job effectiveness and thereby enhancing firm performance (Kinisa, 2019). Taken together, signaling theory accounts for why firms with high debt-to-equity ratios might increase human capital investment, while motivation theory explains how those investments translate into improved performance. Accordingly, the following hypothesis is proposed:

H2: Financial structure (long-term debt-to-equity ratio) has a positive indirect effect on firm performance

through investments in human capital development.

Within the conceptual framework, the relationship between firm size and firm performance is explicitly modeled with an emphasis on firms' investments in human capital development. Larger firms are expected to signal a greater commitment to workforce development than smaller firms, thereby enhancing reputation and stakeholder confidence. Consequently, firm size is hypothesized to have a positive direct effect on firm performance. Conversely, financial structure—operationalized as the long-term debt-to-equity ratio—is expected to exert a direct negative effect on performance. From an accounting perspective, higher long-term debt increases interest and principal obligations, which can reduce reported profits; accordingly, financial structure is hypothesized to be negatively associated with firm performance (Ebaid, 2009).

These relationships are illustrated in Figure 1: Research Conceptual Framework.

Conceptual Framework

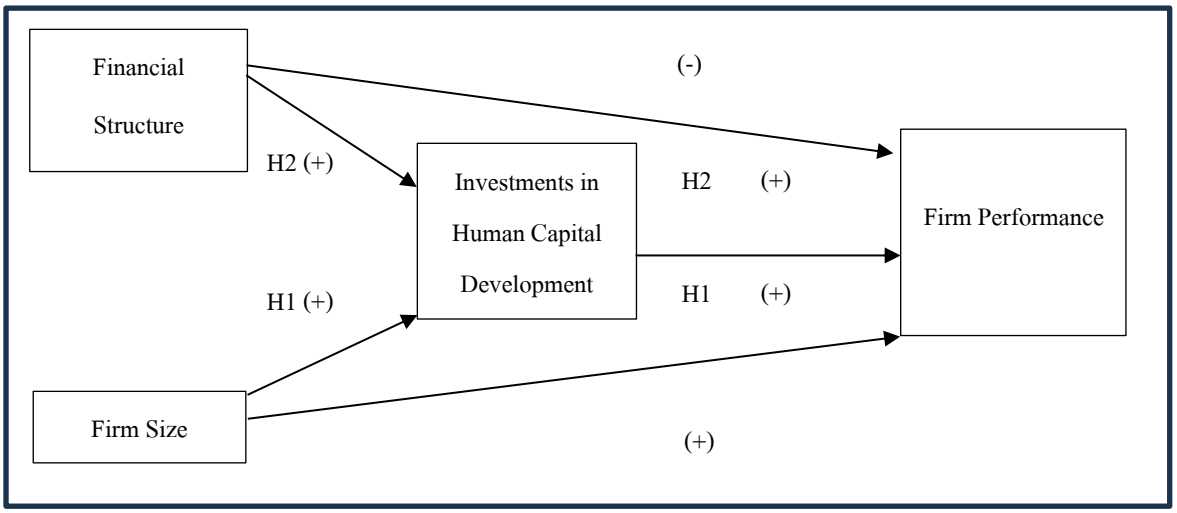


Figure 1 Research Conceptual Framework

Research Methodology

Population and Sample

The population for this study comprised companies listed on the Stock Exchange of Thailand (SET and MAI). Studying both the SET and the MAI for improving representativeness of the Thai capital market by covering large- and mid-cap firms on the SET as well as smaller or start-up firms on the MAI, thereby enabling more generalizable conclusions about Thailand's capital market. The analysis focused on the COVID-19 crisis period. The sample covers 2021–2022 and yielded a total of 892 firm-year observations for hypothesis testing. Additional year-by-year analyses were performed: 2021 [486] observations; 2022 [406] observations.

Data Collection

Data were collected from secondary sources, namely annual financial statements and 56-1 One Report filings available in the SETSMART database of the Stock Exchange of Thailand for the years 2021–2022. The sample was restricted to firms that disclosed training expenses, as these firms provided observable measures of investment in human capital development.

During the study period, listed companies in Thailand were affected by the COVID-19 crisis and many adjusted their operating processes—often incorporating artificial intelligence and other technologies—to accommodate new working conditions. In response, firms placed greater emphasis on workforce development to support operations in the altered environment. Accordingly, this study investigates the relationship between investment in human capital development and firm performance over 2021–2022.

Model Used for Analyzing Relationships

This study utilized path analysis to examine the relationships between firm size and firm performance through investments in human development, as well as the relationship between financial structure and firm performance through investments in human development. This analysis was conducted using path analysis implemented through two regression equations, with emphasis on the key variables that capture investment in human capital. The primary path models focused on four core variables—firm size, financial leverage (debt-to-equity), investment in human capital, and return on assets. The models omitted additional control variables for the following methodological reasons. First, the path analysis was specified using observed manifest variables measured at the interval/ ratio level. To preserve model identification and to maintain straightforward interpretation of direct and indirect effects, categorical controls (for example, industry dummy variables) were not included in the primary path equations. Second, potential continuous controls such as total assets were excluded because they were highly collinear with the chosen proxy for firm size (number of employees). Including total assets alongside employee count risked severe multicollinearity, which would have inflated standard errors, destabilized coefficient estimates, and undermined the reliability of the path estimates. To avoid redundant indicators of firm scale and to preserve model parsimony, number of employees was used as the sole firm-size measure. Third, some theoretically relevant constructs—most notably job/task complexity—could not be measured reliably at the firm level with the available data. Although industry classification can serve as an imperfect proxy for task complexity, industry dummies are categorical and therefore incompatible with the continuous manifest-variable specification adopted for the primary path analysis. Where a construct could not be measured with sufficient validity or completeness, exclusion from the baseline path models was preferred to inclusion on the basis of noisy or inconsistent indicators.

Finally, investment in human capital development was proxied by training expenditures reported in financial statements rather than training hours. Training hours could have been confounded by job characteristics and task complexity across industries, whereas training expenditures more accurately reflected a firm's resource commitment to human capital development and were considered reliable because they were drawn from financial statements.

A review of the literature used to develop the research hypotheses indicated that financial structure and firm size positively influence investments in human capital, and that such investments, in turn, positively affect firm performance. In this study, firm size ($LnSize_{it}$) was measured as the natural logarithm of the number of employees. This metric was chosen to capture job complexity and the scale of human capital requirements. While prior studies commonly proxied firm size using total assets or registered capital, it was argued here that, in the context of human capital research, the number of employees was a superior proxy because it more accurately reflected the operational scale and the necessity for investment in human capital development. Financial structure ($LnFinStruc_{it}$) was measured as the natural logarithm of the long-term debt-to-equity ratio to reflect reliance on long-term borrowing, new investment financed through debt, and the firm's financial position.

Accordingly, Model 1 treated financial structure and firm size as independent variables and investment in human capital as the dependent variable. Prior research also indicated that debt levels and firm size could directly affect organizational performance. High indebtedness increased interest and principal obligations, which could depress performance (Grossman & Livingstone, 2009). Evidence on the size–performance relationship was mixed: some studies reported a negative association (Strecker, 2009), while others found no significant correlation (Meiryani et al., 2020). However, in the context of firms listed on the Stock Exchange of Thailand, larger companies enjoyed cost advantages and greater investor credibility, enabling them to achieve higher profitability than smaller firms (Lee, 2009). Therefore, Model 2 specified firm performance as the dependent variable and includes investment in human capital development, financial structure, and firm size as direct predictors.

The model used to test these relationships through path analysis was illustrated as follows:

$$LnInvestHum_{it} = \beta_0 + \beta_1 LnSize_{it} + \beta_2 LnFinStruc_{it} + \varepsilon_{it} \quad .... (1)$$

$$FirmPerf_{it} = \beta_0 + \beta_1 LnSize_{it} + \beta_2 LnFinStruc_{it} + \beta_3 LnInvestHum_{it} + \varepsilon_{it} \quad .... (2)$$

Where:

$FirmPerf_{it}$ (Firm Performance) = Net $Income_{it}$ / Total $Equity_{it}$

$LnFinStruc_{it}$ (Financial Structure) = Ln [Total Long-term $Debt_{it}$ / Total

$LnSize_{it}$ (Firm Size) = Ln [Number of $Employee_{it}$]

$LnInvestHum_{it}$ (Investments in Human Capital = Ln [Employee Training $Costs_{it}$]

Note: Ln refers to the Natural Logarithm; i = firm index (firm i), i =1,…,N; t = year index

This analysis examined the indirect effects of firm size and of financial structure on firm performance, each of which was mediated by investments in human capital development. The expected results from the path analysis were illustrated below:

(1) Expected Relationships According to Research Hypothesis 1: In Model 1, a positive relationship was anticipated between firm size ($LnSize_{it}$) and investments in human capital development ($LnInvestHum_{it}$). In Model 2, a positive relationship was expected between investments in human capital development ($LnInvestHum_{it}$) and firm performance ($FirmPerf_{it}$).

(2) Expected Relationships According to Research Hypothesis 2: In Model 1, a positive relationship was anticipated between financial structure ($LnFinStruc_{it}$) and investments in human capital development ($LnInvestHum_{it}$). In Model 2, a positive relationship was expected between investments in human capital development ($LnInvestHum_{it}$) and firm performance ($FirmPerf_{it}$).

Additional Tests

To evaluate these hypotheses, the following additional tests were conducted. First, the models were estimated separately for 2021 and 2022 using path analysis. Second, industry controls were introduced, and regression models were re- estimated to assess sensitivity to industry composition. The analysis included 8 industry categories: Agro & Food, Technology, Financials, Service, Industrials, Consumer Products, Property & Construction, and Resources. These categories were represented by 7 dummy variables, defined as follows:

Agro = 1 if the firm was in Agro & Food; 0 otherwise.

Tech = 1 if the firm was in Technology; 0 otherwise.

Fin = 1 if the firm was in Financials; 0 otherwise.

Serv = 1 if the firm was in Service; 0 otherwise.

Indus = 1 if the firm was in Industrials; 0 otherwise.

Consump = 1 if the firm was in Consumer Products; 0 otherwise.

Popcorn = 1 if the firm was in Property & Construction; 0 otherwise.

Firms with all dummy variables equal to 0 were classified as Resources (reference category).

The Result of the Study

Table 1 presents the descriptive statistics of the variables used to test the relationships in this study. The sample was drawn from financial statements and 56-1 One Report of companies listed on the Stock Exchange of Thailand for the years 2021-2022, a period marked by the COVID-19 crisis in Thailand. The variable for investments in human development—measured by training costs ($LnInvestHum_{it}$)—was assessed using the natural logarithm of training expenses, yielding a mean of 13.023, a standard deviation of 2.134, a maximum value of 21.645, and a minimum value of 5.395. The financial structure ($LnFinStruc_{it}$) was measured by the natural logarithm of the debt-to-equity ratio, with a mean of -0.335, a standard deviation of 1.065, a maximum value of 3.162, and a minimum value of -4.605. Firm size ($Lnsize_{it}$) was measured by the natural logarithm of the number of employees, resulting in a mean of 6.368, a standard deviation of 1.437, a maximum value of 12.029, and a minimum value of 3.178. Firm performance ($FirmPerf_{it}$) was measured by the ratio of net income to total equity, with a mean of 0.081, a standard deviation of 0.146, a maximum value of 0.860, and a minimum value of -0.686.

The skewness values for the variables were as follows: $LnInvestHum_{it}$ at 0.398, $LnSize_{it}$ at 0.496, $LnFinStruc_{it}$ at -0.278, and $FirmPerf_{it}$ at -0.234. The kurtosis values were 1.069 for $LnInvestHum_{it}$, 0.338 for $LnFinStruc_{it}$, 0.594 for $LnSize_{it}$ and 4.922 for $FirmPerf_{it}$. Furthermore, the skewness values for all variables used in the analysis ranged from -3 to +3, and the kurtosis values ranged from -10 to +10, indicating that the variables were normally distributed (Kline, 2011). Additionally, prior to testing the relationships, the correlations among the variables in the model were examined, as shown in Table 2. The Pearson Correlation Coefficients indicated the highest correlation coefficient of -0.520*** (p-value = 0.000) between firm size ($LnSize_{it}$) and

investments in human capital development ($LnInvestHum_{it}$), while the lowest correlation was 0.044* (p-value = 0.093) between firm size ($LnSize_{it}$) and firm performance ($FirmPerf_{it}$). The absolute value of Pearson correlation coefficient is less than 0.8, collinearity is not likely to exist (Belinda, & Peat, 2014; Young, 2017). Therefore, the data are suitable for testing the relationships using path analysis, with the model being a regression analysis model.

Table 1 Descriptive Statistics

n = 892	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
$FirmPerf_{it}$	-0.686	0.860	0.081	0.146	-0.234	4.922
$LnFinStruc_{it}$	-4.605	3.162	-0.335	1.065	-0.278	0.338
$Lnsize_{it}$	3.178	12.029	6.368	1.437	0.496	0.594
$LnInvestHum_{it}$	5.395	21.645	13.023	2.134	0.398	1.069

Table 2 Correlation Matrix

n=892	$FirmPerf_{it}$	$LnFinStruc_{it}$	$Lnsize_{it}$	$LnInvestHum_{it}$
$FirmPerf_{it}$	1.000			
$LnFinStruc_{it}$	-0.097***	1.000		
$Lnsize_{it}$	0.044*	0.215***	1.000	
$LnInvestHum_{it}$	0.115***	0.209***	-0.520***	1.000
Pearson Correlation Coefficients				
The Level of Significance: ***p<0.01, **p<0.05, *p<0.10				

From Table 3, it is evident that the model used to analyze the relationships between firm size, financial structure, investments in human development, and the current return on equity is based on a sample of 892 observations using regression analysis. Model (1) demonstrates a good fit, with an F-value of 173.134*** (p-value = 0.000), an Adjusted R^2 of 0.279, and a Durbin-Watson statistic of 2.047. Model (2) also shows a good fit, with an F-value of 8.664*** (p-value

= 0.000), an Adjusted R^2 of 0.025, and a Durbin-Watson statistic of 1.966. Moreover, Table 3 shows the Tolerance values for the independent variables in both models. In Model 1, the Tolerance value for both $LnFinStruc_{it}$ and $LnSize_{it}$ is 0.954. In Model 2, the Tolerance values are 0.941 for $LnFinStruc_{it}$, 0.718 for $LnSize_{it}$, and 0.720 for $LnInvestHum_{it}$. The Variance Inflation Factor (VIF) values in Table 3 show that Model (1) has a VIF of 1.048 ($LnFinStruc_{it}$ & $LnSize_{it}$), while Model (2) has VIF values of 1.063 ($LnFinStruc_{it}$), 1.393 ($LnSize_{it}$), and 1.390 ($LnInvestHum_{it}$). All variables have VIF values less than 10, along with tolerance values above 0.1, indicating that the variables in the relationship model are independent of one another. Therefore, it can be concluded that none of the variables contribute to multicollinearity issues (Hair, Black, & Anderson, 2010). The research findings reveal that firm size ($LnSize_{it}$) has a positive relationship with investments in human capital development ($LnInvestHum_{it}$), with a regression coefficient of 0.740 (t = 17.100; p-value = 0.000). However, no relationship was found between firm size and firm performance ($FirmPerf_{it}$), with a regression coefficient of 0.000 (t = 3.652; p-value = 0.000).

Regarding financial structure ($LnFinStruc_{it}$), a positive relationship was identified with investments in human capital development ($LnInvestHum_{it}$), reflected by a regression coefficient of 0.204 (t = 3.491; p-value = 0.001). Conversely, financial structure exhibited a negative relationship with firm performance ($FirmPerf_{it}$), with a regression coefficient of -0.017 (t = -3.699; p-value = 0.000). Additionally, investments in human capital development ($LnInvestHum_{it}$) were positively correlated with firm performance ($FirmPerf_{it}$), showing a regression coefficient of 0.010 (t = 3.652; p-value = 0.000).

Table 3 Relationships Among Firm Size, Financial structure, Investments in Human Development, and Firm Performance (Years 2021-2022)

Dependent Variables	$LnInvestHum_{it}$					$FirmPerf_{it}$				
	β	t	p-value	Tolerance	VIF	β	t	p-value	Tolerance	VIF
$Constant_{it}$	8.380	29.209	0.000***			-	-	0.122		
$LnFinStruc_{it}$	**0.204**	3.491	0.001***	0.954	1.048	-	-	0.000***	0.941	1.063
$LnSize_{it}$	**0.740**	17.100	0.000***	0.954	1.048	0.000	-	0.945	0.718	1.393
$LnInvestHum_{it}$						**0.010**	3.652	0.000***	0.720	1.390

Dependent Variables	$LnInvestHum_{it}$		$FirmPerf_{it}$	
Durbin-Watson	2.047		Durbin-Watson	1.966
F-statistic	173.134		F-statistic	8.664
(p-value)	(0.000) ***		(p-value)	(0.000) ***
Adjusted R^2	0.279		Adjusted R^2	0.025
n = 892			n = 892	
The Level of Significance: ***p<0.01, **p<0.05,				

This research includes additional tests of relationships to support the findings presented in Table 3. The results of the tests examining the relationships among firm size, financial structure, investments in human development, and firm performance for the year 2021 are shown in Table 4, while the results for the year 2022 are presented in Table 6. The findings in Table 4 indicate that the model is suitable for testing relationships, with Model (1) showing an F-value of 82.653 (p-value = 0.000) and an Adjusted R^2 of 0.252, along with a Durbin-Watson statistic of 2.185. For Model (2), the model is also deemed suitable, exhibiting an F-value of 6.433 (p-value = 0.000), an Adjusted R^2 of 0.033, and a Durbin-Watson statistic of 2.034. The additional tests in Table 4 utilized a sample size of 486 observations. The analysis reveals that firm size ($LnSize_{it}$) has a positive relationship with investments in human capital development ($LnInvestHum_{it}$), with a regression coefficient of 0.704 (t = 11.871; p-value = 0.000; tolerance = 0.947; VIF=1.056). However, no relationship was found between firm size and firm performance ($FirmPerf_{it}$), as indicated by a regression coefficient of 0.003 (t = 0.571; p-value = 0.568; tolerance = 0.733; VIF = 1.364). Regarding financial structure ($LnFinStruc_{it}$), a positive relationship was identified with investments in human capital development ($LnInvestHum_{it}$), reflected by a regression coefficient of 0.164 (t = 2.082; p-value = 0.038; tolerance = 0.947; VIF = 1.056). Conversely, financial structure exhibited a negative relationship with firm performance ($FirmPerf_{it}$), with a regression coefficient of -0.013 (t = -2.123; p-value = 0.034; tolerance = 0.939; VIF = 1.065). Additionally, investments in human capital development ($LnInvestHum_{it}$) were positively correlated with firm performance ($FirmPerf_{it}$), showing a regression coefficient of 0.012 (t = 3.393; p-value = 0.001; tolerance = 0.745; VIF = 1.342). The correlations among the variables in the model were examined, as shown in Table 5. The absolute value of Pearson Correlation Coefficients is less than 0.8,

collinearity is not likely to exist. Therefore, the data are suitable for testing the relationships using path analysis, with the model being a regression analysis model.

Table 4 Additional Test: Relationships Among Firm Size, Financial structure, Investments in Human Development, and Firm performance (Year 2021)

Dependent Variables	$LnInvestHum_{it}$					$FirmPerf_{it}$				
	β	t	p-value	Tolerance	VIF	β	t	p-value		VIF
Constant	8.865	22.474				-0.095	-2.246	0.025**		
$LnFinStruc_{it}$	**0.164**	2.082	0.038**	0.947	1.056	-0.013	-2.123	0.034**	0.939	1.065
$LnSize_{it}$	**0.704**	11.871	0.000***	0.947	1.056	0.003	0.571	0.568	0.733	1.364
$LnInvestHum_{it}$						**0.012**	3.393	0.001***	0.745	1.342
Durbin-Watson	2.185					Durbin-Watson	2.034			
F-statistic	82.653					F-statistic	6.433			
(p-value)	(0.000) ***					(p-value)	(0.000) ***			
Adjusted R^2	0.252					Adjusted R^2	0.033			
n = 486						n = 486				

The Level of Significance: ***p<0.01, **p<0.05, *p<0.10

Table 5 Correlation Matrix for Table 4

n=486	Variables	1	2	3	4
1	$LnFinStruc_{it}$	1			
2	$LnSize_{it}$	0.230***	1		
3	$LnInvestHunm_{it}$	0.043	-0.205***	1	
4	$FirmPerf_{it}$	-0.057	0.095**	0.121***	1

Pearson Correlation Coefficients

The Level of Significance: ***p<0.01, **p<0.05, *p<0.10

The additional test results presented in Table 6 indicate that the model is suitable for testing the relationships, with an F-value of 98.140 (p-value = 0.000) and an Adjusted R^2 of 0.324,

along with a Durbin-Watson statistic of 2.003. For Model (2), the model is also deemed suitable, exhibiting an F-value of 4.199 (p-value = 0.006), an Adjusted R^2 of 0.023, and a Durbin-Watson statistic of 1.997. The additional tests in Table 6 utilized a sample size of 406 observations. The analysis of the relationships among firm size, financial structure, investments in human development, and firm performance for the year 2022 reveals the following results. Firm size ($LnSize_{it}$) has a positive relationship with investments in human capital development ($LnInvestHum_{it}$), with a regression coefficient of 0.780 (t = 12.725; p-value = 0.000; tolerance=0.961; VIF=1.040). However, no relationship was found between firm size and firm performance ($FirmPerf_{it}$), as indicated by a regression coefficient of -0.005 (t = -0.772; p-value = 0.441; tolerance=0.686; VIF=1.458). Regarding financial structure ($LnFinStruc_{it}$), a positive relationship was identified with investments in human capital development ($LnInvestHum_{it}$), reflected by a regression coefficient of 0.274 (t = 3.244; p-value = 0.001; tolerance=0.961; VIF= 1.040). Conversely, financial structure exhibited a negative relationship with firm performance ($FirmPerf_{it}$), with a regression coefficient of -0.024 (t = -3.213; p-value = 0.001; tolerance= 0.937; VIF= 1.067). Additionally, investments in human capital development ($LnInvestHum_{it}$) were positively correlated with firm performance ($FirmPerf_{it}$), showing a regression coefficient of 0.009 (t = 1.982; p-value = 0.048; tolerance=0.672; VIF=1.487). The correlations among the variables in the model were examined, as shown in Table 7. The absolute value of Pearson Correlation Coefficients is less than 0.8, collinearity is not likely to exist. Therefore, the data are suitable for testing relationships using path analysis, with the model being a regression analysis model.

The additional test reported in Table 8 incorporates industry controls into the regressions. Industry dummies are included in both Model 1 and Model 2 (see Research Methodology for coding). The results in Table 8 are consistent with the main findings reported in Table 3. After controlling for industry, Model 1 shows that several industries—Agro & Food, Service, Industrials, Consumer Products, and Property & Construction—are significantly associated with investment in human capital development. In Model 2, the Agro & Food industry is significantly associated with firm performance. These industry effects do not alter the main results (Table 3) and are discussed further in the next section.

Table 6 Additional Test: Relationships Among Firm Size, Financial structure, Investments in Human Development, and Firm Performance (Year 2022)

Dependent Variables	$LnInvestHum_{it}$					$FirmPerf_{it}$				
	β	t	p-value		VIF	β	t	p-value	Tolerance	VIF
Constant	7.821	19.306	0.000			-0.005	-0.097	0.923		
$LnFinStruc_{it}$	**0.274**	3.244	0.001***	0.961	1.040	-0.024	-3.213	0.001***	0.937	1.067
$LnSize_{it}$	**0.780**	12.725	0.000***	0.961	1.040	-0.005	-0.772	0.441	0.686	1.458
$LnInvestHum_{it}$						**0.009**	1.982	0.048**	0.672	1.487
Durbin-Watson		2.003				Durbin-Watson		1.997		
F-statistic		98.140				F-statistic		4.199		
(p-value)		(0.000)***				(p-value)		0.006)***		
Adjusted R^2		0.324				Adjusted R^2		0.023		
n = 406						n = 406				
The Level of Significance: ***p<0.01, **p<0.05, *p<0.10										

Table 7 Correlation Matrix for Table 6

n=406	Variables	1	2	3	4
1	$LnFinStruc_{it}$	1			
2	$LnSize_{it}$	0.197***	1		
3	$LnInvestHunm_{it}$	0.126***	-0.146***	1	
4	$FirmPerf_{it}$	-0.144***	-0.012	0.074*	1
Pearson Correlation Coefficients					
The Level of Significance: ***p<0.01, **p<0.05, *p<0.10					

Discussion

The primary test results presented in Table 3 are consistent with the additional findings in Tables 4 and 6, and the observed relationships can be discussed as follows:

Direct Relationship Between Firm Size and Investments in Human Capital Development

The results from Table 3 indicate that firm size has a positive relationship with investments in human development. This can be explained by signaling theory, which posits that larger firms possess the capacity to signal or communicate information to investors and external data users (Connelly et al., 2011). The act of signaling information related to investments in human capital development requires significant financial resources. Larger enterprises are often classified as high- quality firms. Research indicates that high- quality firms tend to employ signals that typically incur significant costs, which they are well-equipped to manage. In contrast, lower-quality firms may lack the financial capacity to absorb these expenses (Akerlof, 1970).

Table 8 Additional Test: Relationships Among Firm Size, Financial structure, Investments in Human Development, Industry Type and Firm Performance

Dependent Variables	$LnInvestHum_{it}$			$FirmPerf_{it}$		
	β	t	p-value	β	t	p-value
Constant	8.887	25.410	0.000***	-0.043	-1.161	0.246
$LnFinStruc_{it}$	0.129	2.088	0.037**	-0.017	-3.336	0.001***
$LnSize_{it}$	0.760	17.162	0.000***	-0.002	-.396	0.692
$LnInvestHum_{it}$	-	-		0.009	3.437	0.001***
Agro	-0.682	-2.305	0.021**	0.045	1.885	0.060*
Tech	-0.039	-0.131	0.896	0.033	1.395	0.164
Financial	-0.400	-1.325	0.186	0.022	0.907	0.365
Serv	-0.742	-2.906	0.004***	0.003	0.144	0.885
Indus	-1.091	-4.209	0.000***	0.016	0.746	0.456
Consump	-1.002	-3171	0.002***	-0.014	-0.538	0.591
Propcon	-0.703	-2.736	0.006***	-0.018	-0.860	0.390
Durbin-Watson	2.090			Durbin-Watson	1.986	
F-statistic	42.989			F-statistic	4.270	
(p-value)	(0.000)***			(p-value)	(0.000)***	
Adjusted R^2	0.298			Adjusted R^2	0.035	
n = 892				n = 892		

The Level of Significance: ***p<0.01, **p<0.05, *p<0

Furthermore, larger firms signal their quality by communicating their investments in human capital development through disclosures in their financial reports. The findings align with those of Black et al. (1999), who indicated that training programs for new employees serve as a method for reducing the costs associated with monitoring employees. The costs of employee training vary according to the size of the establishment, as larger firms enjoy cost advantages, particularly due to economies of scale in training. These cost advantages lead to increased training opportunities for employees in larger firms. Moreover, larger firms have more complex operations and a higher number of employees, often with lower educational qualifications, requiring extensive training. In contrast, smaller companies usually employ fewer workers with higher educational backgrounds and less operational diversity. Consequently, larger firms tend to exhibit higher levels of investment in human capital development compared to smaller firms (Waddoups, 2011).

Direct Relationship Between Financial structure and Investments in Human Capital Development

The test results reveal that the financial structure, as indicated by the ratio of long-term debt to total equity, exhibits a positive correlation with investments in human capital development. This phenomenon can be understood through the lens of signaling theory, which posits that firms with substantial long-term debt convey this information to investors to foster confidence in their long-term investment initiatives, which are expected to yield future returns (Bird & Smith, 2005). To mitigate information asymmetry between management and investors, companies with a high financial structure strive to communicate to investors that they are effectively managing the risks associated with their debt by investing in human capital development. This investment enhances operational efficiency and enables investors to anticipate the company's capacity to manage the costs associated with its debt obligations. Consistent with signaling theory, which states that the sender must decide how to convey information and the receiver must determine how to interpret the signal (Connelly et al., 2011), the company aims to communicate that its elevated debt levels reflect significant investments in long-term projects. Furthermore, the company is committed to developing the skills and knowledge of its personnel to ensure effective execution of these long-term initiatives.

Direct Relationships of Financial Structure and Firm Performance

The analysis conducted using Model 2, as detailed in Table 3, along with the additional tests in Tables 4 and 6, demonstrates a negative direct relationship between financial structure (LnFinStruc) and firm performance (Return on Equity), as noted by Kodongo, Mokoaleli-Mokoteli, and Maina (2014) and Farah, Amin, and Pramudianto (2021). The increase in long-term debt, sourced from debt financing, introduces risks related to interest payments and principal repayments, which consequently impact the reduction of net profit (Grossman & Livingstone, 2009; Zhang et al., 2020). When a firm decides to take on long-term debt, it must consider the cost conditions of the debt burden and the potential for high returns on investment, which justifies the decision to invest in long-term debt. A firm's ability to incur debt indicates that creditors have assessed the firm as capable of meeting its debt and interest obligations. Nonetheless, this research focuses on examining accounting performance within the same year as the debt incurrence. In years when firms incur higher levels of debt, there is a direct negative impact on the return on equity due to the expenses arising from debt, which reduces the firm's net profit. This aligns with the findings of Siregar and Harahap (2021) and Sukma, Nurtina, and Nainggolan (2022), who discovered a negative relationship between the debt-to-equity ratio and return on equity. Susilawati, Shavab, and Mustika (2022), who found a negative relationship between the debt-to-equity ratio and performance measured by return on assets.

Direct Relationships of Firm Size and Firm Performance

Under normal operating conditions, larger firms are often more efficient than smaller ones because they can exploit economies of scale. However, the literature on this relationship is mixed. Some studies (e.g., Fiegenbaum & Karnani, 1991; Lee, 2009; Dogan, 2013) report positive effects of size on performance, while others emphasize circumstances in which large size may be a disadvantage. For example, in adverse conditions large firms frequently exhibit a high degree of operating leverage (DOL)—a relatively large proportion of fixed costs versus variable costs—which amplifies profit volatility in response to sales fluctuations. Strecker (2009) notes that firm size reflects available financial and human resources, but also that large firms may face lower competitive advantages than smaller firms due to the substantial effort required to realize economies of scale.

In this study, no direct relationship between firm size and performance was found. This result aligns with Ginting and Nasution (2020) and Sukma et al. (2022), who also reported no significant effect of firm size on return on equity. One plausible explanation is measurement: this study used employee count as the proxy for firm size, while data were collected during the COVID-19 crisis when employees in some industries were unable to work under normal processes, potentially obscuring true size-related effects. Supporting this measurement issue, Dogan (2013) found that firm size measured by employee count did not correlate with return on assets (ROA), whereas size measured by the natural logarithm of total assets or total sales was significantly associated with ROA. Krist (2009) further shows that firm size can act as an intermediary factor in the relationship between internationalization and performance, adding complexity to the size–performance link.

These distinctions in measurement and context complicate attempts to draw a clear, generalizable conclusion about the direct effect of firm size on performance. Future research should explore alternative size proxies (e.g., total assets or sales), consider contextual factors such as crisis conditions, and investigate potential mediating or moderating variables to better clarify this relationship.

Indirect Effects of Firm Size and Financial Structure on Firm Performance via Investments in Human Capital Development

Table 3 shows that investments in human capital development are positively associated with organizational performance. Because firm size is positively related to such investments, firm size therefore has a positive indirect effect on performance mediated by investments in human capital. Larger firms are better positioned than smaller firms to allocate resources to human capital development and, given their typically more complex operations, place greater emphasis on skill enhancement—actions that ultimately improve overall firm performance (Waddoups, 2011).

Similarly, the financial structure exerts a positive indirect influence on firm performance through investments in human capital development. Financing long-term projects with debt often requires firms to strengthen employee knowledge and capabilities to implement those projects effectively. Employee training and development increase skills and competencies that translate into improved performance, thereby raising firm performance (Cormier, Aerts, Ledoux, & Magnan, 2009; Kinisa, 2019; Amin, 2022). Moreover, training can enhance employees' sense of job security

and motivation, which further encourages higher effort and better performance outcomes (Datrika et al., 2021; Ruth et al., 2024).

The path-analysis results indicate that firm size affects firm performance indirectly through investment in human capital development; likewise, the financial structure (debt-to-equity ratio) affects firm performance indirectly via the same investment channel. The analysis also reveals a direct negative relationship between financial structure and firm performance, while no direct relationship is observed between firm size and performance. Annual path analyses for 2021 and 2022 (Tables 4 and 6) yield results consistent with the main findings reported in Table 3. Robustness checks using separate regression analyses that include industry type (Table 8) corroborate the direct effects of firm size and financial structure on investment in human capital development, and the positive effect of such investment on firm performance. These additional tests likewise confirm the absence of a direct link between firm size and performance and the presence of a direct relationship between financial structure and performance, thereby supporting the relationships presented in Table 3.

Conclusion

Based on the study's findings and the preceding discussion, firm size exerts a positive indirect effect on firm performance through investments in human capital development. When a firm expands its operations, it signals to stakeholders that it can manage growth effectively; this signaling often prompts increased investment in employee development. Enhanced human capital improves task performance and profitability (Khalique et al., 2011; Osiobe, 2019; Chen, 2020) and also boosts employee motivation, job security, and career progression, which further supports stronger organizational outcomes (Noch & Khotimah, 2024). It is important to emphasize, however, that firm size did not show a direct relationship with performance in this research, indicating that larger firms are not necessarily more profitable than smaller ones on a direct basis.

Similarly, the financial structure—measured by the debt-to-equity ratio—has a positive indirect relationship with firm performance via investments in human capital. Under signaling theory, firms with higher leverage often communicate commitments to long-term projects, which in turn necessitate investment in workforce skills and knowledge to ensure successful execution. Such human capital investments reassure creditors about the firm's ability to meet obligations and

reassure investors about the prospects for project returns, while also improving employee motivation and operational effectiveness (Cormier et al., 2009; Kinisa, 2019; Amin, 2022; Datrika et al., 2021; Ruth et al., 2024). At the same time, the debt-to-equity ratio was found to have a direct negative effect on performance: higher long-term debt increases interest expenses and can reduce current profitability. Consequently, firms with elevated leverage may report lower performance in the short term compared with more conservatively financed peers. In conclusion, both firm size and financial structure influence performance indirectly by fostering investments in human capital, yet high leverage can also exert a contemporaneous negative impact on profitability.

Suggestion

Suggestion for Further Study

1. This study focused on human capital development investment in terms of internal organizational knowledge (Knowledge Capital), specifically emphasizing training. However, it did not classify the types of knowledge and skills provided to employees. Therefore, future research should consider the different types of human capital development and the long-term outcomes resulting from investments in human development.

2. Further research should explore these opposing pathways and their implications over different time horizons.

Suggestion of This Study Results

1. Firms planning to expand should develop human-capital investment plans as a strategic tool to enhance their profitability.

2. Increases in long-term debt can impair a firm's profitability; therefore, firms should implement human-capital development plans to strengthen overall profit-generating capacity.

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