INTELLECTUAL CAPITAL, R&D AND SUSTAINABLE FINANCIAL PERFORMANCE: MODERATING ROLE OF FIRM CHARACTERISTICS IN AN EMERGING MARKET

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ABSTRACT

Intellectual capital (IC) is a crucial driver of sustainable financial performance, particularly in the chemical and pharmaceutical industries. This study uses panel data from Vietnamese firms between 2017 and 2022 to investigate how IC and research and development (R&D) investment influence firm sustainability in an emerging market. This research, compared with previous studies, confirms the positive impact of IC and R&D on short- and long-term financial stability and also highlights the moderating role of firm characteristics. Specifically, firm size and growth rate enhance the benefits of R&D investment, whilst older firms exhibit a diminishing effect, potentially owing to reduced adaptability or innovation capacity. By emphasising the relationship amongst R&D, IC and firm characteristics, this study offers fresh insights into maximising financial sustainability in dynamic markets. Findings provide a foundation for future research and practical strategies to foster long-term competitiveness in emerging economies.

***Keywords*:** Intellectual capital, R&D investment, sustainable financial performance, chemical and pharmaceutical firms, firm characteristics.

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1. INTRODUCTION

Vietnam is transitioning from an agricultural to an industrial economy, with the chemical and pharmaceutical sectors experiencing significant growth (Hai et al., 2022). Despite its advantages in geography and natural resources (Luu, 2021), the country faces such challenges as limited infrastructure, skilled labour shortages and a reliance on imported raw materials (Nguyen et al., 2024). To overcome these issues, firms must invest heavily in research and development (R&D) to enhance innovation, product quality and efficiency. Intellectual capital (IC) plays a crucial role in supporting R&D, driving innovation and ensuring sustainable financial performance (SFP). However, the combined effects of IC and R&D on SFP remain underexplored, particularly in emerging markets, such as Vietnam.

This study applies Penrose's (2009) resource-based theory (RBT) and Grant's (1996) knowledge-based view (KBV) to examine IC's role in strengthening firms' innovation and sustainability. KBV, which is an extension of RBT, highlights knowledge as a key resource for competitive advantage (Xi et al., 2023). Although previous studies have examined IC's impact on financial and sustainability performance across industries (Alvino et al., 2021; Ahmad, 2024; Bontis et al., 2018; Chowdhury et al., 2019; He et al., 2024; Kweh et al., 2019; Ge & Xu, 2021; Mollah & Rouf, 2022; Ullah et al., 2022; Xu & Wang, 2018; Xu et al., 2019; Xu & Liu, 2021; Zhang et al., 2021; Xu & Li, 2022; Ting et al., 2023), research specifically addressing IC, R&D and SFP in Vietnam's chemical and pharmaceutical sectors has remained limited. The current study provides the following contributions. Firstly, this research focuses on Vietnam's chemical and pharmaceutical industries, which are still developing but receive limited research attention. Secondly, this study identifies all IC components and emphasises innovation capital (i.e. R&D) in SFP. Thirdly, the current research addresses data limitation by manually collecting firm-level information. Lastly, this study utilises four financial sustainability metrics to ensure robust results.

The findings provide valuable insights for managers, policy-makers and investors interested in Vietnam and Southeast Asia. The remainder of this article is organised as follows. Part 2 reviews the related literature. Part 3 outlines the methodology. Part 4 presents the results. Lastly, Part 5 provides the findings, conclusions and recommendations.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Theoretical framework

2.1.1 IC

IC is knowledge that can be converted into value, with human capital playing a key role (Bulitia et al., 2018**;** Edvinsson & Sullivan, 1996**)**. IC includes knowledge, intellectual property (IP) and experience, driving competitive advantage through expertise, technology and customer relationships (Amit & Schoemaker, 1993; Bontis et al., 2018; Stewart, 2010). IC is particularly crucial in knowledge-intensive industries, such as pharmaceuticals and chemicals (Youndt et al., 2004). Traditionally, IC comprises human and structural capital (Bontis et al., 2018). Eventually, customer or relational capital was introduced (Nimtrakoon, 2015; Shih et al., 2010). Pulic (1998, 2000, 2004) proposed the value added intellectual coefficient (VAIC) model, including human capital, structural capital and capital employed, widely is supported by research (Kweh et al., 2019; Ting et al., 2023; Welly et al., 2021). Bontis et al. (2018) later integrated relational capital.

Recent studies expand the VAIC model to include innovation capital, emphasising R&D and technological advancements (Gao et al., 2020; Xu & Liu, 2019). The VAIC model, which includes innovation capital, has gained recognition (Gao et al., 2020; Tiwari, 2022; Welly et al., 2021; Xu et al., 2021). Innovation capital reflects a firm's ability to generate new knowledge and improve process through R&D (Xu & Liu, 2020, 2021; Xu & Wang, 2018). However, firms in emerging economies, such as Vietnam, struggle to effectively leverage IC to constraints in skilled labour and technological resources.

2.1.2 SFP

SFP reflects a firm's ability to maintain long-term growth and stability whilst maximising shareholder value. Although Smith (1776) emphasised profit maximisation as a driver of economic growth, recent research highlights the importance of financial sustainability (Martínez-Ferrero & Frias-Aceituno, 2015). Financial performance is commonly assessed through financial statements (Ameer & Othman, 2012; Ching et al., 2017; Santis et al., 2016; Thayaraj & Karunarathne, 2021). However, SFP measurement varies across industries and markets. Recent studies suggest combining financial metrics (ROA, ROE, EBITDA) with sustainability indicators (ESG scores, carbon footprint) for a comprehensive evaluation (Lee & Yeh, 2024; Patel et al., 2020). Beyond profitability, SFP considers financial stability and corporate responsibility (Ameer & Othman, 2012; Ching et al., 2017; Santis et al., 2016; Thayaraj & Karunarathne, 2021). Long-term performance is evaluated through financial stability ratios and risk-adjusted returns (Gleißner et al., 2022).

2.1.3 Challenges of R&D in Developing Markets

R&D investment is crucial for innovation and financial sustainability, but Vietnam faces significant challenges in fostering R&D activities. Financial constraints limit firms' ability to invest in long-term R&D because access to venture capital and government grants is limited (Pham et al., 2023; Vu & Tran, 2021). Vietnam's R&D expenditure remains low, with only $1 per capita compared with nearly $1,000 in OECD countries (World Bank, 2016). Weak institutional frameworks and regulatory uncertainties hinder R&D development, given that insufficient IP protection discourages investment (Tran, 2023). Thirdly, Human capital shortages also limit R&D capabilities because many skilled STEM graduates seek opportunities overseas (World Bank, 2016). Lastly, supply chain dependencies and technological gaps increase costs and reduce flexibility, particularly in the pharmaceutical and chemical sectors (Thang & Phong, 2023).

2.2 Hypothesis Development

2.2.1 Impact of IC on SFP

IC enhances financial sustainability by leveraging intangible resources, improving innovation and creating competitive advantages (Chowdhury et al., 2019; Ge & Xu, 2021). Studies have confirmed a strong positive relationship between IC and SFP (Lee & Yeh, 2024; Xu & Wang, 2018). The VAIC model is widely used to assess IC efficiency and its impact on performance (AlMomani et al., 2023; Chowdhury et al., 2019; Lee & Yeh, 2024; Xu & Li, 2022 ; Xu & Liu, 2021). RBV theory (Penrose, 2009; Wernerfelt, 1984) supports this relationship, emphasising that firms with unique, knowledge-based resources achieve long-term competitive advantages. IC, which comprises human, structural and relational capital, directly influences innovation, resource optimisation and financial sustainability (Ge & Xu, 2021; Xu & Wang, 2018). However, in such emerging markets as Vietnam, institutional constraints, limited access to capital and weak intellectual property protections hinder firms from fully leveraging IC (Xu & Li, 2022). On the basis of this evidence, the following hypothesis is proposed:

H1: IC efficiency positively impacts SFP of chemical and pharmaceutical firms.

2.2.2 Innovation Capital Efficiency (RDEm) and Sustainable Finance

Innovation capital, particularly R&D investment, enhances financial sustainability by improving technology and optimising production (Festa et al., 2020; Ting et al., 2023). However, findings on the direct impact of R&D on SFP remain inconsistent (Ge & Xu, 2021; Xu & Wang, 2018). Some studies have suggested a positive relationship (Festa et al., 2020; Martínez-Ferrero & Frias-Aceituno, 2015), whilst others have indicated that industry and market conditions influence the effect (Xu & Liu, 2020). In Vietnam, firms face financial constraints, regulatory issues and weak IP protection, thereby limiting their ability to maximise innovation capital benefits. Hence, the following hypothesis is proposed on basis of the preceding discussion:

H2: Innovation capital efficiency positively impacts SFP of chemical and pharmaceutical firms.

2.2.3 Moderating Role of Firm Characteristics in the R&D–SFP Relationship

R&D investment is a key driver of financial sustainability, especially in pharmaceuticals and chemicals (Chung et al., 2019; Meles et al., 2023; Yildirim, 2020). However, the impact of R&D on SFP is moderated by firm characteristics, including size, age and growth rate (Alam et al., 2020; Hutauruk, 2024). Firm size influences R&D efficiency and its effects on firm value (Shiva, 2019; Zhu et al., 2021). Larger firms, with greater financial and capital resources, can invest more in R&D, assume higher risks and benefit from economies of scale, leading to higher returns and sustained financial growth (Chen et al., 2019; Muhammad et al., 2022; Zhu et al., 2021). Conversely, smaller firms gain from agility and adaptability (Yildirim, 2020). Thus, the moderating effect of firm size on the R&D–SFP relationship is complex, with larger firms benefiting from scalability and resource advantages, whereas smaller firms leverage adaptability. This influence varies across industries, market conditions and firm capabilities. On the basis of the preceding analysis, we propose the following hypothesis:

H3: Firm size moderates the impact of R&D investment on SFP of chemical and pharmaceutical firms.

Firm growth significantly influences R&D investments' impact on SFP. High-growth firms, driven by strong market demand, invest substantially in long-term R&D projects, thereby enhancing financial sustainability. Zhu et al. (2021) found that R&D positively impacts corporate growth, particularly benefiting private firms in China's manufacturing sector. Chung et al. (2019) observed that higher R&D investment leads to greater growth in Korean pharmaceutical firms. Conversely, low-growth firms face resource constraints, thereby limiting their ability to convert R&D investments into financial returns. Thus, firm growth moderates the R&D–SFP relationship. High-growth firms leverage R&D for innovation, market expansion and efficiency, whereas low-growth firms may struggle to benefit owing to financial constraints. Accordingly, we propose the following hypothesis:

H4: Firm growth moderates the relationship between R&D investment and SFP in chemical and pharmaceutical firms.

Firm age plays a crucial role in the R&D–SFP relationship. Older firms benefit from accumulated knowledge, structured operations and market experience, thereby improving R&D efficiency (Rafiq, 2016). Their long-standing stakeholders' relationships also facilitate innovation commercialisation and mitigate investment risks. However, as firms mature, they may face organisational rigidity and resistance to change, prioritising incremental improvements over radical innovation. Although this approach ensures stability, it may limit long-term financial gains. Thus, older firms may see a weaker link between R&D investment and SFP, despite their experience and market presence. By contrast, younger firms are more adaptable but may struggle with inefficient R&D management (Coad et al., 2013; Coad et al., 2016). Thus, the moderating effect of firm age on the R&D–SFP relationship is twofold. Older firms leverage stability and experience to maximise R&D returns but may struggle with breakthrough innovation. By contrast, younger firms are more adaptable but may face challenges in efficiently managing R&D investments, leading to inconsistent financial performance. On the basis of the preceding analysis, we propose the following hypothesis:

H5: Firm age moderates the relationship between R&D investment and SFP in chemical and pharmaceutical firms.

3. DATA AND METHODOLOGY

3.1 Data

This study examines firms in the Vietnamese chemical and pharmaceutical industry listed on the Vietnamese Stock Market. Initially, 47 firms were identified. Eventually, seven firms were excluded owing to data limitations: three lacked sufficient financial statements covering 2017–2022 and four had incomplete or inconsistent financial data, including missing R&D expenditure details. These exclusions were necessary to ensure analytical consistency and accurate variable measurement. After applying these criteria, the final data set comprised 40 firms, resulting in 240 firm-year observations. This selection ensures the reliability and robustness of this study's findings by maintaining standardised and consistent financial data.

3.2 Measurement of Variables

The study scale for the variables used in the research model is provided in Table 1.

Table 1: Measurement of variables

Variable	Symbol	Measurement	References
Dependent variables			
1. **Sustainable growth rate**	**SGR**	Earning Income/ Everage Owner's Equity	Xu & Wang (2018), Guliyev & Muzaffarov (2024)
2. **Going-concen Index**	**Z-Score**	0,012X1+0,014X2+0,033X3+0,006X4 +0,999X5 - X1 = Working Capital/Total Assets - X2 = Undistributed Profit/Total Assets - X3=Profit before interest and taxes/Total assets - X4 = Market value/ Total Liabilities - X5: Revenue/Total assets	Festa et al. (2020), Elmahgop (2024)
3. **Return on assets**	**ROA**	Net Profit / Average Total Assets	Xu & Wang (2018), Kweh et al. (2019), Ge & Xu (2021) , Xu & Li (2022), Ting et al. (2023)
4. **Profit before interest, taxes and depreciation**	**EBITDA**	Logarithm (Profit before tax + Interest + Depreciation)	Ge & Xu (2021), Chen & Rahman (2023).
Independent variables			
5. **Intellectual capital efficiency**	**$VAIC_m$**	$HCE_m + SCE_m + CEE_m + RDE_m + RCE_m$	Xu & Wang (2018), Kweh et al. (2019), Ge & Xu, (2021), Zhang et al. (2021), Xu & Li (2022), Ting et al. (2023), He et al. (2024)
6. **Innovation capital Efficiency**	**RDE_m**	R&D / VA_m	
Control variables			
7. Firm size	**FSIZE**	Logarithm (Total Assets)	Xu & Wang (2018), Kweh et al. (2019), Xu & Liu (2020), He et al. (2024)
8. Growth rate	**GROWTH**	$(DT_n - DT_{n-1}) / DT_{n-1}$	Kweh et al. (2019), Xu & Liu (2021), Ge & Xu (2021)
9. Firm Age	**AGE**	Current year – Establishment year	Abdi et al. (2022)
10. Financial Leverage	**FLEV**	Total liabilities / Total Assets)	Xu & Wang (2018), Ge & Xu (2021), Xu & Liu, (2021), Zaighum et al. (2024)
11. Board Size	**BSIZE**	Total number of members of the Board of Directors	Kweh et al. (2019), Ting et al. (2023)
12. Tangible	**TANG**	Residual value of tangible fixed assets/Total assets	Kweh et al. (2019), Ting et al. (2023)

3.3 Regression Model

After formulating the research hypotheses, the author developed three regression models. Model (1) examines the impact of IC effectiveness (VAICm) on SFP. Model (2) further assesses the effect of R&D investment (RDEm) on SFP. Lastly, Model (3) explores the moderating roles of firm size, growth rate and age in the relationship between R&D investment and SFP.

Model (1):

$$Y_{i,t} = \alpha_0 + \alpha_1 VAIC_{mi,t} + \alpha_k \sum Controls_{i,t} + \varepsilon_{i,t}$$

Model (2):

$$Y_{i,t} = \alpha_0 + \alpha_1 RDE_{mi,t} + \alpha_k \sum Controls_{i,t} + \varepsilon_{i,t}$$

Model (3.1):

$$Y_{i,t} = \alpha_0 + \alpha_1 RDE_{mi,t} + \alpha_2\, RDE_{mi,t*} FSIZE_{i,t} + \alpha_k \sum Controls_{i,t} + \varepsilon_{i,t+}$$

Model (3.2):

$$Y_{i,t} = \alpha_0 + \alpha_1 RDE_{mi,t} + \alpha_2 RDE_{mi,t*} GROWTH_{i,t} + \alpha_k \sum Controls_{i,t} + \varepsilon_{i,t}$$

Model (3.3):

$$Y_{i,t} = \alpha_0 + \alpha_1 RDE_{mi,t} + \alpha_3 RDE_{mi,t*} AGE_{i,t} + \alpha_k \sum Controls_{i,t} + \varepsilon_{i,t}$$

where SFP (Yi,t) is measured by sustainable growth rate (SGR), financial stability index (*Z-score*), return on investment (*ROA*) and *EBITDA*; IC (*VAICm*) and innovation capital efficiency (*RDEm*) are key explanatory variables; and control variables include firm size (*FSIZE*), growth rate (*GROWTH*), firm age (*AGE*), financial leverage (*LEV*), board size (*BSIZE*) and asset tangibility (*TANG*).

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 2 highlights significant disparities in growth, financial stability, profitablitlity and IC efficiency amongst Vietnamese chemical and pharmaceutical firms. The average (avg) SGR is 17.4%, with a wide range (1%–30%), reflecting varied expansion strategies. Financial stability, measured by the Z-score (avg. 1.895, SD 0.409), indicates that although some firms maintain strong buffers, others face distress owing to inefficient R&D or regulatory challenges. Profitability also varies, with an average ROA of 20.9% (SD 5.1%), thereby highlighting strong asset utilisation in some firms but struggles in others. EBITDA averages 11.943 (SD 2.156), emphasising market fragmentation, in which dominant firms thrive, whilst others operate with thin margins. IC efficiency shows substantial variation. The average VAICm of 3.409 (range 0.831–20.297, SD 2.499) suggests that although some firms capitalise on IC, others underinvest. R&D investment is notably low, with an average RDEm of 0.001 (max 0.053, SD 0.008), indicating a focus on production and distribution over innovation. This finding aligns with industry trends, in which Vietnamese pharmaceutical firms prioritise generics over patented medicines.

Table 2: Descriptive Statistics

Variables	**N**	**Mean**	**Standard deviation (SD)**	**Min**	**Max**
SGR	240	0.174	0.037	0.097	0.299
Z-Score	240	1.895	0.409	1.020	2.990
ROA	240	0.209	0,051	0.103	0.345
EBITDA	240	11.943	2.156	9.049	24.330
$VAIC_m$	240	3.409	2.499	0.831	20.297
HCE_m	240	2.526	1.600	0.309	12.760
SCE_m	240	0.502	0.724	-2.238	10.991
CEE_m	240	0.331	0.835	0.034	6.616
RDE_m	240	0.001	0.008	0	0.053
RCE_m	240	0.047	0.096	0	0.517
FSIZE	240	11.967	0.540	10.800	13.248
GROWTH	240	0.200	0.913	-0.376	8.729
AGE	240	36.575	18.067	6	95
FLEV	240	0.361	0.153	0.069	0.735
BSIZE	240	6.350	1.702	3	18
TANG	240	0.200	0.141	0.017	0.617

Notes*: Refer to Table 1 for the definition of variables.*
Source: Analysis results from research data.

Table 3 shows the correlation coefficients amongst the variables in the model. The results indicate that all correlations between the variables are below 0.8, suggesting that the research models do not exhibit significant multicollinearity. If there is any multicollinearity present, then its impact is negligible (Farrar & Glauber, 1967).

Table 3: Correlation Matrix

Variable	**SGR**	**ZScore**	**ROA**	**EBITDA**	**VAICm**	**RDEm**	**FSIZE**	**GROW**	**AGE**	**FLEV**	**BSIZE**
SGR											
ZScore	0.77***										
ROA	0.64***	0.92***									
EBITDA	0.67***	0.57***	0.45***								
VAICm	0.58***	0.45***	0.30***	0.79***							
RDEm	0.27***	0.19***	0.10	0.26***	0.31***						
FSIZE	0.39***	0.34***	0.27****	0.56***	0.50***	0.2***					
GROWTH	0.28***	0.28***	0.24***	0.59***	0.17**	-0.003	0.1				
AGE	0.29***	0.20***	0.19***	-0.02	-0.11*	-0.09	0.02	-0.09			
FLEV	0.28***	0.71***	0.84***	0.11	-0.03	-0.09	0.02	0.14**	-0.01		
BSIZE	0.23***	0.18***	0.05	0.06	-0.05	0.085	0.2***	-0.03	-0.06	-0.09	
TANG	0.48***	0.49***	0.42***	0.28***	0.17***	0.09	0.05	0.091	0.14**	0.20***	-0.01

Notes: *(***, **, *) indicates significance at 1%, 5%, 10% levels respectively; Refer to Table 1 for the definition of variables.*
Source: Analysis results from research data.

4.2 Multivariate Analysis

Regression analyses using the pooled OLS, FEM and REM methods confirmed the positive impact of IC on SFP. Pooled OLS results were statistically significant (Prob > F = 0.000 < α = 5%), explaining over 50% of the variation in dependent variables. FEM showed similar significance, except for Model (2), which explained only 26% of the variance. VAICm was significant across all models at the 1% level, whilst R&D investment was only significant in Models (4) and (6). REM also confirmed significance (Prob > chi2 = 0.000 < α = 5%) with over 50% explanatory power. Model selection was determined using the F-, Breusch-Pagan and Hausman tests. The final selections were REM for Models (1), (2), (3) and (6); FEM for Models (4), (7) and (8) and OLS for Model (5). Table 4 presents the selected regression models.

Table 4: Results of the Selected Regression Model

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	SGR	**SGR**	**ZScore**	**ZScore**	**ROA**	**ROA**	**EBITDA**	**EBITDA**
VAICm	**0.008*** **		**0.07*** **		**0.006*** **		**0.55*** **	
	(12.84)		(19.17)		(13.04)		(17.58)	
RDEm		**0.59** **		**5.38*** **		**0.762*** **		18.08
		(2.88)		(3.73)		(5.09)		(1.56)
FSIZE	0.0006	**0.019*** **	0.026	0.223*	**0.006** **	**0.017*** **	2.29***	4.03***
	(0.16)	(4.15)	(1.21)	(2.15)	(3.10)	(6.41)	(4.34)	(4.85)
GROWTH	**0.007*** **	**0.008*** **	**0.06*** **	**0.07*** **	**0.005*** **	**0.007*** **	**1.03*** **	**1.14*** **
	(5.39)	(5.11)	(8.34)	(7.00)	(4.89)	(5.37)	(19.78)	(13.71)
AGE	**0.001*** **	**0.001*** **	**0.006*** **	-0.0035	**0.001*** **	**0.001*** **	-0.04	-0.054
	(6.31)	(4.29)	(9.19)	(-0.55)	(11.73)	(6.65)	(-1.24)	(-1.06)
FLEV	**0.057*** **	**0.042** **	**1.832*** **	**1.57*** **	**0.271*** **	**0.263*** **	0.15	-2.029
	(5.19)	(2.97)	(29.99)	(10.24)	(44.41)	(29.11)	(0.19)	(-1.65)
BSIZE	**0.007*** **	**0.006*** **	**0.064*** **	**0.054*** **	**0.005*** **	**0.003*** **	**0.12*** **	0.05
	(9.21)	(5.83)	(15.16)	(8.11)	(8.09)	(4.51)	(3.49)	(0.85)
TANG	**0.074*** **	**0.072*** **	**0.657*** **	0.173	**0.061*** **	**0.067*** **	**1.92***	-1.52
	(6.24)	(4.69)	(9.98)	(1.16)	(9.09)	(6.87)	(2.49)	(-1.27)
_cons	0.0326	-0.145**	-0.058	-1.61	-0.045*	-0.148***	-17.27**	-33.8***
	(0.72)	(-2.64)	(-0.24)	(-1.44)	(-2.01)	(-4.64)	(-3.05)	(-3.77)
N	240	240	240	240	240	240	240	240
R^2 overall	0.76	0.57	0.94	0.83	0.93	0.89	0.89	0.64
Fixed Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001. *Refer to Table 1 for the definition of variables.*
Source: Analysis results from research data.

This study conducted several tests on the eight research models, including the F-test, modified Wald test for heteroskedasticity, Wooldridge test for autocorrelation and multicollinearity checks. The results show no multicollinearity in any model (i.e. all VIFs are below 2), although Model (8) has autocorrelation. Only Model (5) is free from heteroskedasticity.

Consequently, the pooled OLS regression for Model (5) is considered the final result. By contrast, Models (1), (2), (3), (4), (6), (7) and (8) exhibit heteroskedasticity (Prob > chibar2 and Prob > chi2 < 5%). Therefore, the authors applied the generalised least squares (GLS) method to address heteroskedasticity in the seven models. The results are presented in Table 5.

Table 5: GLS Results of the Models: Insert here

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	SGR	**SGR**	**ZScore**	**ZScore**	**ROA**	**ROA**	**EBITDA**	**EBITDA**
VAICm	**0.009*** **		**0.071*** **		**0.0057*** **		**0.535*** **	
	(14.57)		(21.62)		(13.04)		(24.12)	
RDEm		**0.949*** **		**8.768*** **		**0.785*** **		**38.27*** **
		(4.81)		(6.52)		(5.67)		(3.70)
FSIZE	0.0005	**0.0175*** **	0.0243	**0.165*** **	**0.006** **	**0.017*** **	**0.702*** **	**1.850*** **
	(0.17)	(5.81)	(1.63)	(8.02)	(3.10)	(8.18)	(6.98)	(11.72)
GROWTH	**0.007*** **	**0.0092*** **	**0.054*** **	**0.074*** **	**0.005*** **	**0.007*** **	**1.084*** **	**1.232*** **
	(5.04)	(5.26)	(7.08)	(6.23)	(4.89)	(5.42)	(21.22)	(13.48)
AGE	**0.001*** **	**0.0006*** **	**0.006*** **	**0.005*** **	**0.001*** **	**0.001*** **	**0.009*** **	0.0001
	(10.63)	(6.80)	(14.77)	(7.79)	(11.73)	(8.51)	(3.41)	(0.02)
FLEV	**0.062*** **	**0.053*** **	**1.825*** **	**1.758*** **	**0.271*** **	**0.266*** **	**0.607***	-0.071
	(7.65)	(5.02)	(40.14)	(24.46)	(44.41)	(35.90)	(1.97)	(-0.13)
BSIZE	**0.007*** **	**0.0048*** **	**0.069*** **	**0.051*** **	**0.005*** **	**0.003*** **	**0.108*** **	-0.0201
	(9.47)	(5.12)	(16.78)	(8.02)	(8.09)	(4.58)	(3.90)	(-0.41)
TANG	**0.072*** **	**0.0910*** **	**0.665*** **	**0.823*** **	**0.061*** **	**0.073*** **	**1.659*** **	**3.035*** **
	(8.08)	(7.95)	(13.31)	(10.55)	(9.241)	(9.10)	(4.91)	(5.06)
_cons	0.0317	-0.129***	-0.0851	-1.403***	-0.045**	-0.149***	-0.066	-10.97***
	(1.07)	(-3.63)	(-0.51)	(-5.79)	(-2.01)	(-5.98)	(-0.06)	(-5.89)
N	240	240	240	240	240	240	240	240

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001. *Refer to Table 1 for the definition of variables.*
Source: Analysis results from research data.

4.3 Robust Tests and Advance Analysis

4.3.1 Lagged Effects of VAIC and R&D Investment on SFP

Past VAIC investments positively impact the four SFP measures, confirming the long-term value of IC, especially for firms relying on intangible assets (Table 6). R&D investment also enhances performance in the same period and has a positive lagged effect, although its impact weakens after two years (Table 7). Note that the two-year-old R&D investment is only significant in Models (5) and (8), indicating that R&D spending in Vietnamese chemical and pharmaceutical firms is insufficient for sustained long-term benefits. Instead, SFP is achieved when R&D is integrated with other IC components, including human, structural, relational and employed capital.

Table 6: Impact of VAIC in Previous Years on SFP: Insert here

	SGR_t			**$ZScore_t$**			**ROA_t**			**$EBITDA_t$**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
L. VAICm	**0.01*** **			**0.082*** **			**0.007*** **			**0.54*** **		
	(9.99)			(12.46)			(8.92)			(10.05)		
L2. VAICm		**0.008*** **			**0.067*** **			**0.005*** **			**0.37*** **	
		(5.96)			(7.79)			(4.95)			(4.51)	
L3. VAICm			**0.007*** **			**0.065*** **			**0.005*** **			**0.34** **
			(4.10)			(6.17)			(3.72)			(3.28)
FSIZE	0.005	**0.011** **	**0.016** **	**0.062** **	**0.104*** **	**0.137*** **	**0.009*** **	**0.013*** **	**0.017*** **	**1.14*** **	**1.58*** **	**1.85*** **
	(1.63)	(2.91)	(3.21)	(2.88)	(4.24)	(4.38)	(3.69)	(4.44)	(4.44)	(6.45)	(6.74)	(6.03)
GROWTH	**0.01*** **	**0.022** **	**0.023* **	**0.061*** **	**0.199*** **	**0.192** **	**0.005** **	**0.018** **	**0.018* **	**1.20*** **	**2.16*** **	**2.39*** **
	(3.32)	(2.60)	(2.07)	(4.08)	(3.83)	(2.76)	(3.01)	(2.82)	(2.07)	(9.90)	(4.32)	(3.53)
AGE	**0.001*** **	**0.001*** **	**0.001*** **	**0.006*** **	**0.005*** **	**0.005*** **	**0.001*** **	**0.001*** **	**0.001*** **	0.01	0.004	0.002
	(8.75)	(6.44)	(4.52)	(10.19)	(8.03)	(5.95)	(9.84)	(7.85)	(6.26)	(1.55)	(0.61)	(0.18)
FLEV	**0.049*** **	**0.035** **	**0.038* **	**1.701*** **	**1.661*** **	**1.600*** **	**0.260*** **	**0.253*** **	**0.249*** **	-0.299	-0.965	-1.211
	(4.92)	(2.78)	(2.34)	(25.69)	(21.21)	(15.50)	(34.51)	(26.26)	(19.62)	(-0.55)	(-1.28)	(-1.20)
BSIZE	**0.006*** **	**0.006*** **	**0.006*** **	**0.060*** **	**0.059*** **	**0.059*** **	**0.004*** **	**0.004*** **	**0.003*** **	0.028	0.026	0.005
	(7.01)	(6.17)	(5.28)	(10.64)	(9.47)	(7.87)	(5.50)	(4.58)	(3.39)	(0.61)	(0.43)	(0.07)
TANG	**0.064*** **	**0.072*** **	**0.091*** **	**0.610*** **	**0.640*** **	**0.715*** **	**0.055*** **	**0.058*** **	**0.067*** **	**1.581** **	**2.105* **	**2.378* **
	(5.63)	(5.00)	(4.71)	(8.12)	(7.04)	(5.83)	(6.46)	(5.17)	(4.45)	(2.58)	(2.41)	(1.98)
_cons	-0.019	-0.082	-0.135*	-0.463	-0.884**	-1.27***	-0.07**	-0.12***	-0.16***	-4.295*	-8.84***	-11.7***
	(-0.52)	(-1.86)	(-2.39)	(-1.89)	(-3.20)	(-3.56)	(-2.61)	(-3.46)	(-3.65)	(-2.16)	(-3.33)	(-3.36)
N	200	160	120	200	160	120	200	160	120	200	160	120

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001. *L1, L2, L3 are the VAIC in the years t-1, t-2, t-3 respectively. Refer to Table 1 for the definition of variables.*
Source: Analysis results from research data.

Table 7: Impact of R&D in Previous Years on SFP

		SGR_t			**$ZScore_t$**			**ROA_t**			**$EBITDA_t$**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
L. RDEm	**1.183*** **			**12.58*** **			**0.844*** **			**43.3** **		
	(4.72)			(7.44)			(4.61)			(3.09)		
L2. RDEm		0.497			**5.564** **			**0.510***			22.17	
		(1.59)			(2.71)			(2.19)			(1.22)	
L3. RDEm			**0.877***			2.449			0.192			0.926
			(2.49)			(1.00)			(0.69)			(0.04)
FSIZE	**0.019*** **	**0.021*** **	**0.022*** **	**0.165*** **	**0.179*** **	**0.216*** **	**0.018*** **	**0.019*** **	**0.023*** **	**1.93*** **	**2.0*** **	**2.3*** **
	(5.65)	(5.45)	(4.74)	(7.39)	(7.09)	(6.56)	(7.42)	(6.66)	(6.14)	(10.41)	(9.04)	(7.79)
GROW	**0.011*** **	**0.034*** **	**0.036** **	**0.087*** **	**0.30*** **	**0.295*** **	**0.007*** **	**0.026*** **	**0.025** **	**1.36*** **	**2.7*** **	**2.9*** **
	(4.06)	(3.81)	(3.22)	(5.00)	(5.16)	(3.78)	(3.80)	(3.94)	(2.87)	(9.43)	(5.28)	(4.13)
AGE	**0.001*** **	**0.001*** **	**0.001*** **	**0.005*** **	**0.005*** **	**0.004*** **	**0.001*** **	**0.001*** **	**0.001*** **	0.001	0.001	-0.003
	(6.61)	(5.27)	(4.07)	(7.76)	(6.36)	(4.46)	(7.95)	(7.03)	(5.46)	(0.09)	(0.11)	(-0.36)
FLEV	**0.049*** **	**0.037** **	**0.05** **	**1.714*** **	**1.685*** **	**1.673*** **	**0.26*** **	**0.255*** **	**0.255*** **	-0.427	-0.88	-0.913
	(4.19)	(2.66)	(2.93)	(21.84)	(18.60)	(14.09)	(30.58)	(24.86)	(18.91)	(-0.66)	(-1.10)	(-0.86)
BSIZE	**0.005*** **	**0.005*** **	**0.006*** **	**0.051*** **	**0.053*** **	**0.054*** **	**0.003** **	**0.003*** **	**0.003** **	-0.02	-0.008	-0.02
	(5.02)	(4.95)	(4.54)	(7.67)	(7.34)	(6.30)	(3.94)	(3.68)	(2.83)	(-0.40)	(-0.13)	(-0.26)
TANG	**0.081*** **	**0.093*** **	**0.099*** **	**0.736*** **	**0.798*** **	**0.856*** **	**0.07*** **	**0.069*** **	**0.077*** **	**2.71*** **	**3.1*** **	**3.26** **
	(6.31)	(6.05)	(4.91)	(8.46)	(7.86)	(6.12)	(7.09)	(6.03)	(4.89)	(3.76)	(3.42)	(2.61)
_cons	-0.14***	-0.17***	-0.194***	-1.402***	-1.57***	-2.005***	-0.15***	-0.17***	-0.21***	-11.7***	-13***	-16***
	(-3.66)	(-3.78)	(-3.49)	(-5.31)	(-5.29)	(-5.20)	(-5.40)	(-5.03)	(-4.90)	(-5.36)	(-4.90)	(-4.61)
N	200	160	120	200	160	120	200	160	120	200	160	120

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001. *L1, L2, L3 are the VAIC in the years t-1, t-2, t-3 respectively. Refer to Table 1 for the definition of variables.*

Source: *Analysis results from research data.*

4.3.2 Moderating Role of Firm Characteristics in the R&D-SFP Relationship.

R&D investment is crucial in enhancing SFP by driving economic value, competitiveness and long-term growth (Ma et al., 2022). However, R&D effectiveness depends on firm size (FSIZE), age (AGE) and growth rate (GROWTH). This study examines how these characteristics moderate the R&D–SFP relationship in pharmaceutical and chemical firms. The key findings from Table 8 are summarised as follows.

- Firm Size (FSIZE): Larger firms benefit more from R&D investments across the four SFP measures. *(1)* SGR: The significant RDEm*FSIZE coefficient (1.441, $p<0.001$) in column (3) suggests that larger firms leverage R&D more effectively for revenue growth owing to better infrastructure and R&D capabilities. *(2)* Financial stability (Z-score): The RDEm*FSIZE coefficient (13.06) in column (6) shows that R&D investment enhances financial stability in larger firms. *(3)* ROA: The significant RDEm*FSIZE coefficient (0.798, $p<0.01$) in column (9) indicates higher asset returns from R&D in larger firms. *(4)* EBITDA: The RDEm*FSIZE coefficient (75.77) in column (12) confirms that larger firms achieve greater efficiency through R&D activities.

- Growth Rate (GROWTH): High-growth firms experience a considerably strong positive impact of R&D on SFP. Significant results in columns 2, 5, 8 and 11 indicate that firms with higher growth rates can commercialise innovations faster, leading to sustainable growth, financial stability and profitability. By contrast, slower-growth firms struggle to maximise R&D benefits owing to limited market opportunities and financial constraints.

- Firm Age (AGE): Older firms experience a weaker impact from R&D investments. The negative and significant RDEm*AGE coefficients in columns 3, 6, 9 and 12 suggest that older firms face challenges in effectively leveraging R&D. The possible reason is rigid organisational structures, reduced flexibility or saturated product life cycles, thereby limiting the ability to translate R&D into financial gains.

Therefore, larger and high-growth firms gain more from R&D, thereby enhancing competitiveness, profitability and financial sustainability. By contrast, older firms struggle, especially in asset returns, aligning with Coad et al. (2016) but differing from Rafiq (2016).

Table 8: Moderating Impact of Firm Size, Age and Growth on the R&D–SFP Relationship

		SGR			**Zscore**			**ROA**			**EBITDA**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RDEm	**-17*****	**0.23**	**2.11*****	**-154*****	**3.49**	**20.8*****	**-9.15****	**0.272**	**1.41*****	**-905*****	**-9.217**	**92.7*****
	(-3.77)	(0.83)	(5.83)	(-5.14)	(1.88)	(7.66)	(-2.86)	(1.42)	(5.24)	(-3.83)	(-0.66)	(4.86)
FSIZE	**0.02*****	**0.02*****	**0.02*****	**0.14*****	**0.16*****	**0.17*****	**0.02*****	**0.02*****	**0.02*****	**1.7*****	**1.78*****	**1.73*****
	(4.91)	(5.58)	(5.04)	(7.00)	(7.85)	(7.57)	(7.39)	(8.00)	(8.05)	(10.84)	(11.72)	(11.07)
RDEm *FSIZE	**1.44*****			**13.1*****			**0.798****			**75.8*****		
	(3.98)			(5.44)			(3.10)			(4.00)		
RDEm *GROW		**3.7*****			**27*****			**2.63*****			**243*****	
		(3.73)			(4.01)			(3.77)			(4.75)	
RDEm *AGE			**-0.04**			**-0.4*****			**-0.02****			**-1.69*****
			(-3.78)			(-5.07)			(-2.64)			(-3.38)
GROW	**0.01*****	**0.01*****	**0.01*****	**0.08*****	**0.07*****	**0.07*****	**0.01*****	**0.01*****	**0.01*****	**1.24*****	**1.22*****	**1.25*****
	(5.56)	(5.34)	(5.59)	(6.79)	(6.36)	(5.78)	(5.63)	(5.51)	(5.23)	(14.05)	(14.01)	(13.97)
AGE	**0.001*****	**0.001*****	**0.001*****	**0.01*****	**0.01*****	**0.01*****	**0.001*****	**0.001*****	**0.001*****	0.005	0.002	0.005
	(7.80)	(7.31)	(7.79)	(9.36)	(8.38)	(8.00)	(9.18)	(9.07)	(8.44)	(1.03)	(0.46)	(1.01)
FLEV	**0.06*****	**0.05*****	**0.05*****	**1.77*****	**1.76*****	**1.71*****	**0.267*****	**0.27*****	**0.26*****	0.0101	-0.09	-0.032
	(5.33)	(5.13)	(5.21)	(26.11)	(25.23)	(22.32)	(36.70)	(36.91)	(34.68)	(0.02)	(-0.17)	(-0.06)
BSIZE	**0.01*****	**0.005*****	**0.005*****	**0.05*****	**0.05*****		**0.003*****	**0.003*****		-0.018	-0.018	
	(5.33)	(5.30)	(5.28)	(8.56)	(8.33)		(4.71)	(4.76)		(-0.38)	(-0.38)	
TANG	**0.09*****	**0.09*****	**0.08*****	**0.76*****	**0.82*****	**0.74*****	**0.07*****	**0.07*****	**0.07*****	**2.65*****	**2.99*****	**2.63*****
	(7.45)	(8.12)	(7.25)	(10.14)	(10.84)	(8.67)	(8.65)	(9.32)	(8.16)	(4.50)	(5.23)	(4.38)
_cons	-0.1	-0.12***	-0.102**	-1.1***	-1.3***	-1.1***	-0.13***	-0.14***	-0.13***	-9.36***	-10***	-9.72***
	(-2.79)	(-3.37)	(-2.90)	(-4.81)	(-5.59)	(-4.20)	(-5.28)	(-5.78)	(-5.12)	(-5.07)	(-5.69)	(-5.23)
N	240	240	240	240	240	240	240	240	240	240	240	240

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001. *Refer to Table 1 for the definition of variables.*
Source: Analysis results from research data.

5 DISCUSSION AND CONCLUSIONS

5.1 Discussion

This study confirms a positive relationship between IC efficiency and SFP in Vietnamese chemical and pharmaceutical firms. The findings indicate that considerably high IC efficiency (VAICm) significantly improves SFP, as demonstrated by the statistically significant results in Models (1), (3), (5) and (7). The results support H1 and align with prior research (Ahmad, 2024; Chowdhury et al., 2019; Festa et al., 2020; Ge & Xu, 2021; Kweh et al., 2019; Ting et al., 2023; Xu & Liu, 2021; Xu & Wang, 2018; Xu et al., 2021). The current study highlights that investing in IC, including human capital, technology, production processes and external partnerships, enhances long-term financial performance and competitive advantages. Additionally, the impact of IC investments extends beyond the current year, thereby demonstrating future benefits.

A key contribution of this research is introducing innovation capital efficiency (RDEm) as a measure of R&D efficiency within the IC framework. Unlike traditional models focusing solely on human, structural and relational capital, this study incorporates R&D efficiency, which is particularly crucial for the pharmaceutical and chemical industries, in which innovation drives long-term growth. The results confirm that R&D investments enhance SFP by optimising resources, developing new products and expanding markets. This strong positive relationship between R&D and SFP supports H2 and aligns with prior studies (Ahmad, 2024; Festa et al., 2020; Ting et al., 2023; Xu et al., 2021; Xu & Li, 2022). Firms must obtain Ministry of Health approvals for new product launches to ensure safety, extend product development cycles and increase compliance costs. Meanwhile, government incentives, such as the 'Make in Vietnam' initiative and R&D tax benefits, encourage innovation. However, Vietnamese firms prioritise short-term financial gains over long-term R&D investments, thereby explaining the generally low RDEm values. Lastly, many firms focus on generic drug production rather than pioneering new formulations, thereby limiting the financial impact of R&D efficiency.

An in-depth analysis of firm characteristics as moderators reveals several important insights. Firstly, firm size (FSIZE) and growth rate (GROWTH) amplify the positive impact of R&D on SFP. Larger firms better translate R&D investments into revenue, profits and financial stability, benefiting from economies of scale and better financing access. High-growth firms effectively leverage R&D to improve financial sustainability, enabling them to immediately adapt to market changes and efficiently commercialise innovations. Secondly, firm age (AGE) negatively moderates the R&D–SFP relationship. Older firms are more conservative in adopting R&D initiatives, possibly owing to institutional stagnation and risk aversion, thereby reducing the financial impact of R&D investments. These findings support H3, H4 and H5 and align with Chen et al. (2019), Chung et al. (2019), Coad et al. (2013), Muhammad et al. (2022) and Zhu et al. (2021). The current study suggests that firms should consider their size, growth rate and age when optimising R&D investments to maximise SFP.

5.2 Conclusions and Research Implications

Investments in IC and R&D have accelerated in emerging economies (Alam et al., 2019). This study highlights Vietnam's increasing role in the global economy, in which multinational firms are increasing R&D investments owing to rising demand, lower costs and greater technology adoption.

The findings emphasise that IC and R&D are critical for financial sustainability in Vietnam's chemical and pharmaceutical industries. However, the R&D–SFP relationship is complex, influenced by firm size, age and growth. (1) Larger firms benefit from economies of scale and abundant resources, whereas smaller firms leverage agility and faster innovation cycles. (2) Older firms may enhance R&D efficiency through experience, but their resistance to radical innovation can limit SFP. (3) High-growth firms maximise R&D benefits, whereas low-growth firms struggle to achieve SFP through innovation.

***Practical Implications*:** Industry-specific strategies.
In the pharmaceutical and chemical industries, IC drives innovation and financial stability. Firms with strong IC develop high-quality teams, boost competitiveness and mitigate financial risks. Continuous R&D investment fosters innovation, enables market expansion and secures long-term advantages. To strengthen financial sustainability, firms should pursue the following undertakings: (1) develop in-house R&D capabilities through internal departments, open innovation models and collaborations with universities; (2) invest in digital transformation, integrating AI, big data and automation to enhance R&D efficiency, accelerate drug development and optimise production and (3) establish innovation hubs and pharmaceutical and chemical clusters, facilitating collaboration amongst academia, industry and government to accelerate technological advancements.

Theoretical Significance: This study reinforces Penrose's RBT (2009) and Grant's knowledge-based view (1996), highlighting IC and innovation as key drivers of competitiveness. It validates IC's role in enhancing SFP in emerging economies (e.g. Vietnam) and expands theoretical models by exploring IC's impact on competitiveness, innovation and corporate social responsibility (CSR). Additionally, it underscores the need for improving IC measurement methods to increase their accuracy across various industries and national contexts.

Limitations and Future Research Directions

Despite demonstrating the positive impact of IC and R&D on SFP, this study has some limitations. Firstly, corporate governance should be examined to understand how board structures, leadership styles and ownership concentration affect the IC–SFP relationship. Secondly, comparative ASEAN studies could offer insights into Vietnam's pharmaceutical and chemical industries relative to regional competitors. Lastly, longitudinal studies tracking IC investments over extended periods would provide an improved understanding of the long-term financial impact of innovation effort.

REFERENCES

Abdi, Y., Li, X., & Càmara-Turull, X. (2022). Exploring the impact of sustainability (ESG) disclosure on firm value and financial performance (FP) in airline industry: the moderating role of size and age. *Environment, Development and Sustainability*, *24*(4), 5052–5079.

Ahmad, F. (2024). The relationship between intellectual capital, financial stability, firm performance, market value, and bankruptcy risk: Empirical evidence from Pakistan. *Journal of the Knowledge Economy*, 1–49.

Alam, A., Uddin, M., Yazdifar, H., Shafique, S., & Lartey, T. (2020). R&D investment, firm performance and moderating role of system and safeguard: Evidence from emerging markets. *Journal of Business Research*, *106*, 94-105.

AlMomani, K. M. D. K., AlWadi, B. M., & Al-Wadi, S. (2023, May). The Nexus of Intellectual Capital and Firm Performance: Evidence from Jordanian Pharmaceutical Companies. In *Conference on Sustainability and Cutting-Edge Business Technologies* (pp. 173-185). Cham: Springer Nature Switzerland.

Alrabei, A. M., Al-Othman, L. N., Abutaber, T. A., Alathamneh, M. S., Almomani, T. M., Qeshta, M. H., & Amareen, S. A. M. (2023). Nexus between Intellectual Capital and Financial Performance Sustainability: Evidence from Listed Jordanian Firms. *Applied Mathematics & Information Sciences*, *17*(5), 881–888.

Alvino, F., Di Vaio, A., Hassan, R., & Palladino, R. (2021). Intellectual capital and sustainable development: A systematic literature review. *Journal of Intellectual Capital*, *22*(1), 76–94.

Ameer, R., & Othman, R. (2012). Sustainability practices and corporate financial performance: A study based on the top global corporations. *Journal of Business Ethics*, *108*, 61–79.

Amin, S., Usman, M., Sohail, N., & Aslam, S. (2018). Relationship between intellectual capital and financial performance: The moderating role of knowledge assets. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, *12*(2), 521–547.

Amit, R., & Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33–46.

Bontis, N., Ciambotti, M., Palazzi, F., & Sgro, F. (2018). Intellectual capital and financial performance in social cooperative enterprises. *Journal of Intellectual Capital*, *19*(4), 712–731.

Bulitia, G., Wanjala, J. W., & Mwangi, G. W. (2018). Knowledge management as a tool for employee retention in Saccos. *International Journal of Innovative Research and Advanced Studies (IJIRAS), 5(3)*, 160-167.

Castro, J. P. G., Ramírez, D. F. D., & Escobar, J. M. (2021). The relationship between intellectual capital and financial performance in Colombian listed banking entities. *Asia Pacific Management Review*, *26*(4), 237–247.

Chen, H., & Rahman, M. J. (2023). Intellectual capital and financial performance: evidence from Chinese retail firms. *International Journal of Learning and Intellectual Capital*, *20*(4), 394–409.

Chen, T. chun, Guo, D. Q., Chen, H. M., & Wei, T. ti. (2019). Effects of R&D intensity on firm performance in Taiwan's semiconductor industry. *Economic Research-Ekonomska Istraživanja*, *32*(1), 2377–2392. https://doi.org/10.1080/1331677X.2019.1642776

Ching, H. Y., Gerab, F., & Toste, T. H. (2017). The quality of sustainability reports and corporate financial performance: Evidence from Brazilian listed companies. *Sage Open*, *7*(2), 1-9.

Chowdhury, L. A. M., Rana, T., & Azim, M. I. (2019). Intellectual capital efficiency and organisational performance: In the context of the pharmaceutical industry in Bangladesh. *Journal of Intellectual Capital*, *20*(6), 784–806.

Chowdhury, P., Lau, K. H., & Pittayachawan, S. (2019). Operational supply risk mitigation of SME and its impact on operational performance: a social capital perspective. *International Journal of Operations & Production Management*, *39*(4), 478–502.

Coad, A., Segarra, A., Teruel, M., 2013. Like milk or wine: does firm performance improve with age?. *Structural Change and Economic Dynamics*, *24*, 173-189.

Coad, A., Segarra, A., & Teruel, M. (2016). Innovation and firm growth: does firm age play a role?. *Research policy*, *45*(2), 387-400.

Edvinsson, L., & Sullivan, P. (1996). Developing a model for managing intellectual capital. *European Management Journal*, *14*(4), 356–364. https://doi.org/10.1016/0263-2373(96)00022-9.

Elmahgop, F. O. (2024). Intellectual Capital and Bank Stability in Saudi Arabia: Navigating the Dynamics in a Transforming Economy. *Sustainability*, *16*(10), 4226.

Farrar, D. E., & Glauber, R. R. (1967). Multicollinearity in Regression Analysis: The Problem Revisited. *The Review of Economics and Statistics*, *49*(1), 92-107. https://doi.org/10.2307/1937887.

Festa, G., Rossi, M., Kolte, A., & Marinelli, L. (2020). The contribution of intellectual capital to financial stability in Indian pharmaceutical companies. *Journal of Intellectual Capital*, *22*(2), 337–359.

Gao, Q., Xu, J., Tao, Z., Liu, L., & Wu, C. (2020). Exploration and analysis on the psychological capital of entrepreneurship and the deviant innovation behavior of employees. *Frontiers in Psychology*, *11*, 1880.

Ge, F., & Xu, J. (2021). Does intellectual capital investment enhance firm performance? Evidence from pharmaceutical sector in China. *Technology Analysis & Strategic Management*, *33*(9), 1006–1021.

Gleißner, W., Günther, T., & Walkshäusl, C. (2022). Financial sustainability: measurement and empirical evidence. *Journal of Business Economics*, *92*(3), 467–516.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, *17*(S2), 109–122.

Guliyev, T., & Muzaffarov, M. (2024). Deciphering Sustainable Growth: The Influence of Corporate Financial Metrics on SGR and Stock Returns. *WSB Journal of Business and Finance*, *58*(1), 114–121. https://doi.org/10.2478/wsbjbf-2024-0011

Hai, N. C., Chuong, H. N., & Trung, T. (2022). Linkages and development of local industrial space: Research in the key economic region of Southern Vietnam. *Cogent Economics & Finance*, *10*(1), 2109273.

He, D.-S., Liu, T.-W., & Lin, Y.-Y. (2024). Efficiency evaluation of intellectual capital for value creation: a case study of the semiconductor industry in Taiwan. *Journal of Intellectual Capital*, *25(4)*, 744-774.

Hutauruk, M. R. (2024). The effect of R&D expenditures on firm value with firm size moderation in an Indonesia palm oil company. *Cogent Business & Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2317448

Kweh, Q. L., Ting, I. W. K., Hanh, L. T. M., & Zhang, C. (2019). Intellectual capital, governmental presence, and firm performance of publicly listed companies in Malaysia. *International Journal of Learning and Intellectual Capital*, *16*(2), 193–211.

Luu, D. H. (2021). The impact of capital structure on firm value: A case study in Vietnam. *The Journal of Asian Finance, Economics and Business*, *8*(5), 287–292.

Ma, Z., Novoselov, K. E., Stice, D., & Zhang, Y. (2022). Firm innovation and covenant tightness. *Review of Accounting Studies, 29(1), 151-193*. https://doi.org/10.1007/s11142-022-09712-1

Martínez-Ferrero, J., & Frias-Aceituno, J. V. (2015). Relationship between sustainable development and financial performance: international empirical research. *Business Strategy and the Environment*, *24*(1), 20–39.

Meles, A., Salerno, D., Sampagnaro, G., Verdoliva, V., & Zhang, J. (2023). The influence of green innovation on defaultrisk: Evidence from Europe. *International Review of Economics & Finance*, *84*, 692–710. https://doi.org/10.1016/j.iref.2022.11.036

Mollah, M. A. S., & Rouf, M. A. (2022). The impact of intellectual capital on commercial banks' performance: evidence from Bangladesh. *Journal of Money and Business*, *2*(1), 82–93.

Muhammad, H., Migliori, S., & Consorti, A. (2022). Corporate governance and R&D investment: does firm size matter? *Technology Analysis & Strategic Management*, *36*(3), 518–532. https://doi.org/10.1080/09537325.2022.2042508

Nguyen, P.-H., Nguyen, L.-A. T., Nguyen, T.-H. T., & Vu, T.-G. (2024). Exploring Complexities of Innovation Capability in Vietnam's IT Firms: Insights from An Integrated MCDM Model-based Grey Theory. *Journal of Open Innovation: Technology, Market, and Complexity*, *10(3)*, 1-17.

Nimtrakoon, S. (2015). The relationship between intellectual capital, firms' market value and financial performance: Empirical evidence from the ASEAN. *Journal of Intellectual Capital*, *16*(3), 587–618.

Patel, P. C., Guedes, M. J., Pagano, M. S., & Olson, G. T. (2020). Industry profitability matters: The value of sustainable growth rate and distance from bankruptcy as enablers of venture survival. *Journal of Business Research*, *114*, 80–92.

Pham, T. T. T., Nguyen, T. V. H., Nguyen, S. K., & Nguyen, H. T. H. (2023). Does planned innovation promote financial access? Evidence from Vietnamese SMEs. *Eurasian Business Review*, *13*(2), 281-307.

Penrose, E. T. (2009). *The Theory of the Growth of the Firm*. Oxford university press.

Pulic, A. (1998). Measuring the performance of intellectual potential in the onowledge economy. *The 2nd" World Congress on the Management of Intellectual Capital"*, disk.

Pulic, A. (2000). VAIC™–an accounting tool for IC management. *International Journal of Technology Management*, *20*(5–8), 702–714.

Pulic, A. (2004). Intellectual capital–does it create or destroy value? *Measuring Business Excellence*, *8*(1), 62–68.

Rafiq, S., Salim, R., & Smyth, R. (2016). The moderating role of firm age in the relationship between R&D expenditure and financial performance: Evidence from Chinese and US mining firms. *Economic Modelling*, *56*, 122–132.

Santis, P., Albuquerque, A., & Lizarelli, F. (2016). Do sustainable companies have a better financial performance? A study on Brazilian public companies. *Journal of Cleaner Production*, *133*, 735–745.

Shih, K., Chang, C., & Lin, B. (2010). Assessing knowledge creation and intellectual capital in banking industry. *Journal of Intellectual Capital*, *11*(1), 74–89.

Shiva, S. (2019). The Moderating Role of Institutional Quality, Leverage and Size in the Relationship between R&D Investments and Firm Value. MSc International Financial Management, Faculty of Economics and Business,University of Groningen, 1–75. http://www.diva-portal.se/smash/get/diva2:1289114/Fulltext01.pdfShun-Yu

Smith, A. (1776). *An Inquiry into The Nature and Causes of The Wealth of Nations: Volume One*. London: printed for W. Strahan; and T. Cadell, 1776.

Soewarno, N., & Tjahjadi, B. (2020). Measures that matter: an empirical investigation of intellectual capital and financial performance of banking firms in Indonesia. *Journal of Intellectual Capital*, *21*(6), 1085–1106.

Stewart, T. A. (2010). *Intellectual Capital: The New Wealth of Organization*. Crown Currency.

Stewart, T., & Capital, I. (1997). *The new wealth of organizations*. Nicholas Brealey, London.

Thayaraj, M. S., & Karunarathne, W. (2021). The impact of sustainability reporting on firms' financial performance. *Journal of Business and Technology*, *5*(2), 51-73.

Thang, P. D., & Phong, H. N. (2023). Study on the impact of the pharmaceutical industry on economic development and investment opportunities in Vietnam. *International Journal of Health & Medical Sciences*, *6*(2), 99-110. https://doi.org/10.21744/ijhms.v6n2.2127.

Ting, I. W. K., Asif, J., Kweh, Q. L., & Tebourbi, I. (2023). Intellectual capital and firm performance: the moderating effect of controlling shareholders in Malaysia. *International Journal of Learning and Intellectual Capital*, *20*(2), 166–192.

Tiwari, R. (2022). Nexus between intellectual capital and profitability with interaction effects: panel data evidence from the Indian healthcare industry. *Journal of Intellectual Capital*, *23*(3), 588–616.

Tran, Quang Phu (2023). Opportunities and barriers in innovation activities of small and medium enterprises. Finance magazine issue 2, July 2023. [Vietnamese name: Cơ hội và rào cản trong hoạt động đổi mới sáng tạo của doanh nghiệp nhỏ và vừa. Tạp chí tài chính kỳ 2 tháng 7/2023].

Ullah, H., Wang, Z., Mohsin, M., Jiang, W., & Abbas, H. (2022). Multidimensional perspective of green financial innovation between green intellectual capital on sustainable business: the case of Pakistan. *Environmental Science and Pollution Research*, *29*(4), 5552–5568.

Vu, Q., & Tran, T. Q. (2021). Government financial support and firm productivity in Vietnam. *Finance research letters, 40*, 101667.

World Bank (2016). *Vietnam overview*. http://www.worldbank.org/en/country/vietnam/overview

Welly, Y., Ikhsan, A., & Situmeang, C. (2021). The effect of capital employed, human capital and structural capital on financial performance on the consumer goods sector period 2015-2019. *International Journal of Trends in Accounting Research*, *2*(1), 72–86.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, *5*(2), 171–180.

Wernerfelt, B. (1995). Resource-based strategy in a stochastic model. In *Resource-Based and evolutionary theories of the firm: towards a synthesis* (pp. 133–145). Springer.

Xi, M., Fang, W., & Feng, T. (2023). Green intellectual capital and green supply chain integration: the mediating role of supply chain transformational leadership. *Journal of Intellectual Capital*, *24*(4), 877–899.

Xu, J., & Li, J. (2022). The interrelationship between intellectual capital and firm performance: evidence from China's manufacturing sector. *Journal of Intellectual Capital*, *23*(2), 313–341.

Xu, J., & Liu, F. (2021). Nexus between intellectual capital and financial performance: An investigation of Chinese manufacturing industry. *Journal of Business Economics and Management*, *22*(1), 217–235.

Xu, J., Shang, Y., Yu, W., & Liu, F. (2019). Intellectual capital, technological innovation and firm performance: Evidence from China's manufacturing sector. *Sustainability*, *11*(19), 5328.

Xu, & Liu, F. (2020). The impact of intellectual capital on firm performance: A modified and extended VAIC model. *Journal of Competitiveness*, *12(1), 1*61-176.

Xu, & Wang, B. (2018). Intellectual capital, financial performance and companies' sustainable growth: Evidence from the Korean manufacturing industry. *Sustainability*, *10*(12), 1-15.

Xu, X. L., Li, J., Wu, D., & Zhang, X. (2021). The intellectual capital efficiency and corporate sustainable growth nexus: Comparison from agriculture, tourism and renewable energy sector. *Environment, Development and Sustainability*, 1–19.

Xu, X., & Liu, C. K. (2019). How to keep renewable energy enterprises to reach economic sustainable performance: from the views of intellectual capital and life cycle. *Energy, Sustainability and Society*, *9*, 1–10.

Yıldırım, D. (2020). Relationship between R&D Investment and Firm Value from R&D Intensity, Firm Size and Risk Perspectives: Evidence from Turkey. *Book: Researches on Financial Performance*, 79–97.

Youndt, M. A., Subramaniam, M., & Snell, S. A. (2004). Intellectual capital profiles: An examination of investments and returns. *Journal of Management Studies*, *41*(2), 335–361.

Zaighum, I., Abbas, Q., Batool, K., Bano, S., & Sajjad, S. M. (2024). Intellectual capital and firm risk: evidence from an emerging economy. *Global Knowledge, Memory and Communication, Vol. ahead-of-print, No. ahead-of-print*.

Zhang, L., Yu, Q., Jin, Z., & Xu, J. (2021). Do intellectual capital elements spur firm performance? Evidence from the textile and apparel industry in China. *Mathematical Problems in Engineering*, *2021*(1), 1-12, 7332885.

Zhu, H., Zhang, Z., Huang, Y., & Mao, W. (2021). Quantile heterogeneous impact of R&D on firm growth in Chinese manufacture: how ownership, firm size and sectors matter? *Applied Economics*, *53*(28), 3267–3287. https://doi.org/10.1080/00036846.2021.1873235