

# INTELLECTUAL CAPITAL AND FIRM PERFORMANCE: EXPLORING THE EFFECTS OF FINANCIAL LEVERAGE IN VIETNAM

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## ABSTRACT

This study explores the relationship among intellectual capital (IC), financial leverage, and firm performance using data on Vietnam's top 200 firms (2015–2021). Results show that intellectual capital positively affects firm performance. We also find that the positive relationship is less prominent in firms with higher financial leverage, indicating a negative moderating effect. This conclusion applies to long- and short-term debts. Our study highlights the crucial role of IC in enhancing firm performance, while also indicating the negative moderating effect of financial leverage on this relationship. Findings offer practical insights for firms and policymakers, emphasizing that investing in IC and maintaining optimal leverage can enhance firm performance and sustainable value creation in Vietnam.

*JEL classification:* G31, G32, O32

*Keywords:* financial leverage, firm performance, intellectual capital, Vietnam.

*Submission:* 23<sup>rd</sup> July 2025

*Accepted:* 07<sup>th</sup> November 2025

<https://doi.org/10.33736/ijbs.12813.2026>

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## 1. INTRODUCTION

Recently, many countries have rapidly transitioned from manufacturing and retail-driven economies to knowledge-based and technology-oriented models (Canibano et al., 2000). In the current business landscape, intellectual capital (IC) has taken center stage as an important contributor to the development of companies, surpassing the significance of tangible assets (Xu and Liu, 2020). The ability to efficiently process and manage resources characterized by being “valuable, rare, inimitable, and irreplaceable” is crucial for leveraging IC and achieving outstanding performance. This transition highlights the evolving nature of economic landscapes, in which the prowess in managing intangible assets becomes a cornerstone for sustainable growth and success in the corporate scope.

Given the pivotal role of IC, researchers have investigated its influence on firm performance in various countries. However, their findings remain diverse and multifaceted. Several studies, including those of Ting and Lean (2009), Zéghal and Maaloul (2010), Clarke et al. (2011), and Kweh et al. (2022), underscore the positive correlation between IC and its components with firm performance. Conversely, Ting et al. (2022) present contrasting evidence, demonstrating a negative relationship between IC and bank efficiency in Taiwan. Stahle et al. (2011) document that IC and its components exhibit no discernible impact on firm performance in Finland. These varied conclusions highlight the complexity and contextual nuances involved in understanding the relationship between IC and firm outcomes across countries.

This study adds to existing literature by investigating the influence of IC on firm performance within the context of Vietnam, along with the moderating role of financial leverage. Note that Vietnam has positioned itself as one of the world’s fastest-growing economies, marked by substantial economic reforms and seamless integration into the global market. The country’s success is underscored by heightened foreign direct investment, expanded trade activities, and robust industrial development. Serving as a pivotal manufacturing hub, Vietnam’s active participation in international trade agreements significantly bolsters the global supply chain. Furthermore, the Vietnamese government’s recent emphasis on encouraging firms to invest in IC reflects a strategic initiative to enhance firm value and foster competitive advantage. Despite this, the current body of research on IC in Vietnam remains limited, with only a few studies, such as Kweh et al. (2022), exploring the non-linear relationship between IC and corporate efficiency.

Our study, using data from the 200 largest firms listed on Vietnamese stock markets, reveals a positive correlation between IC and firm performance, as measured by return on assets (ROA), return on equity (ROE), and Tobin’s Q (TobinQ). By dissecting IC into three key components, namely, capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE), we demonstrate that each of these components maintains a positive association with firm performance. This compelling evidence underscores the significant role of IC in augmenting overall firm performance in Vietnam.

We further examine the role of firm debt in shaping the relationship between IC and firm performance. We focus on financial leverage because, as highlighted by Pham et al. (2025), financial resources are critical determinants of firm development. The acquisition and strategic

allocation of funds enable businesses to invest in key areas enhancing IC, which encompasses knowledge, innovation, and intangible assets. Adequate financial support fosters robust research and development initiatives, driving technological advancements and the creation of proprietary knowledge. Moreover, it enables companies to attract and retain top-tier talent, invest in employee training and development programs, and cultivate a culture that values continuous learning, thereby strengthening the human capital component of IC. Financial resources can also be directed toward acquiring intellectual property, upgrading technological infrastructure, and expanding market presence through networking and collaborations, which collectively enhance the overall intellectual capital of the organization.

Conversely, high debt levels can undermine the positive effects of IC on firm performance through several mechanisms. Elevated leverage diverts financial resources toward debt servicing, reducing the capital available for critical investments, such as R&D, employee development, and technological upgrades. This situation creates a “debt overhang,” discouraging firms from pursuing long-term, high-risk initiatives essential for innovation and growth. Excessive debt amplifies financial distress risks, increases the cost of capital, and forces firms to adopt conservative strategies, thereby limiting the dynamic utilization of IC. Managerial focus often shifts from value creation to financial survival, reducing the effectiveness of intellectual resources. High debt may also erode stakeholder confidence, thereby weakening relational capital, whereas restrictive debt covenants constrain managerial flexibility, thereby impeding the ability to realign intellectual resources with emerging opportunities. As firms prioritize short-term financial obligations over long-term IC investments, those with high debt-to-total-assets ratios dilute the benefits of IC, a trend evident across long- and short-term debts. Thus, balancing financial leverage is essential for leveraging the full potential of IC for sustainable success.

Our findings, consistent with the preceding dynamics, reveal that firm leverage negatively moderates the positive effect of IC on firm performance, with this mitigation being markedly pronounced in firms with high long-term debt. After accounting for potential multicollinearity by mean-centering leverage, we find no robust evidence for nonlinearity in this moderation effect. This finding highlights the importance of managing leverage to avoid eroding IC.

Our study makes significant contributions to two distinct strands of the literature on the field. First, we establish that IC plays a crucial role in shaping firm performance in Vietnam. In addition, we demonstrate a positive correlation among the three key elements of IC, namely, capital employed, human capital, and structural capital efficiencies; and firm performance metrics, such as ROA, ROE, and Tobin’s Q. These findings align with the conclusions drawn in prior studies (e.g., Zéghal and Maaloul, 2010, Clarke et al., 2011, Kweh et al., 2022).

Second, to the best of our knowledge, this research is the first to document the impact of financial leverage on the relationship between IC and firm performance in Vietnam. Recent studies on IC in Vietnam primarily focus on its direct effect on firm performance (Hoang et al., 2020), bank performance (Vo and Tran 2021), or its influence on firm performance as moderated by digital transformation (Vo and Tran 2025), firm characteristics (Le et al., 2025), or corporate governance (Van et al., 2022). We find that the influence of IC is minimally pronounced in firms with high

debt levels; this finding applies to long- and short-term debts. This insight has significant implications for firm stakeholders and policymakers, highlighting the nuanced interplay among IC, financial leverage, and overall business performance in the Vietnamese context.

The remainder of this paper is structured as follows. Section 2 presents a brief review of the literature and outlines the development of hypotheses. Section 3 details the data and methodology utilized in this study. Section 4 discusses the main results. Lastly, Section 5 concludes this research.

## **2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

### ***2.1. Background Theory***

The resource-based view (RBV) emphasizes that unique resources, including IC, drive competitive advantage and enhance firm performance. RBV posits that businesses with distinct resources and strategies create value that rivals find difficult to replicate, thereby fostering sustainable growth (Barney, 1991). In the current knowledge-based economy, intangible assets, such as IC—comprising knowledge, innovation, and intellectual property—are increasingly critical for success (Le et al., 2021).

Resources can be tangible or intangible, but Kweh et al. (2022) suggest that tangible resources often depreciate rapidly. Consequently, RBV places considerable emphasis on intellectual and mental capacities, particularly in the current knowledge-based economy, in which companies increasingly rely on knowledge sources over traditional ones. Thus, IC is categorized as a knowledge resource that significantly influences the formation of competitive advantage (Le et al. 2021), thereby contributing to the success and sustainable development of businesses.

Production theory highlights the operational benefits of IC investments but also cautions that reliance on debt may diminish these benefits by elevating financial costs (Douglas, 1976). Strategic IC investments improve efficiency when executed effectively; however, excessive borrowing can hinder their impact by increasing overall investment costs. Together, RBV and production theory underscore the need for optimal resource utilization and balanced financial strategies to maximize IC's potential.

### ***2.2. IC and Firm Performance***

IC, defined as the collective knowledge, skills, and intangible assets within an organization (Stewart, 1997), is often categorized into human, structural, and relational components (Bontis, 1998). Methods to measure IC, such as the value-added intellectual coefficient (VAIC), assess the efficiency of capital employed (CEE), human capital (HCE), and structural capital (SCE). Although studies generally find a positive relationship between IC and firm performance (Chen et al., 2005; Nadeem et al., 2018), some report mixed or negligible results, varying by context and industry (Firer and Williams, 2003; Dzenopoljac et al., 2017). Firer and Williams (2003) argue

that VAIC has no significant effect on firm performance for firms in South Africa. Stahle et al. (2011) also find no relationship between VAIC and firm performance in Finland.

The impact of VAIC components on firm performance is mixed. Although such studies as Chen et al. (2005) and Phusavat et al. (2011) find positive correlations between HCE and SCE with firm performance, others report contrasting results. Firer and Williams (2003) find that HCE negatively affects firm performance in South Africa, with SCE having the opposite effect. Dzenopoljac et al. (2017) report a negative relationship between HCE and firm performance in the Arab region.

In Vietnam, the relationship among IC, financial leverage, and firm performance is underexplored. Existing studies suggest that IC fosters innovation and enhances performance (Le et al., 2023), while external financing supports innovation in small and medium-sized enterprises (Pham et al., 2023). However, the moderating effect of financial leverage on IC's impact remains generally unexplored, thereby creating a significant research gap.

### **2.3. Hypothesis Development**

RBV and production theories highlight the importance of IC in enhancing the operational efficiency of companies. On the basis of the previously discussed literature, we formulate the following hypothesis:

*H1: IC has positive impact on firm performance in Vietnam.*

In contrast to the literature on the effect of IC on firm performance, the impact of financial leverage on the relationship between IC and firm performance is underexplored. Recent studies on the field mainly focus on the relationship between IC and financial leverage. D'Amato (2021) shows that firms with high IC tend to have relatively low leverage for an Italian sample. Jin and Xu (2022) document that financial leverage is relatively low in agricultural firms in China. By contrast, Dalwai and Sewpersadh (2023) examine a sample of 45 listed tourism companies of nine Middle Eastern countries and show that firms with high capital employed efficiency tend to have substantial leverage. This divergent evidence in the relationship between IC and financial leverage leads us to formulate the following hypothesis:

*H2: Financial leverage moderates the relationship between IC and firm performance in Vietnam.*

## **3. METHODOLOGY**

### **3.1. Sample Selection**

We manually collect data from publicly listed firms in Vietnam, spanning from 2015 to 2021. We choose to initiate our sample from 2015 for two main reasons. First, the issuance of Circular 200/2014/TT-BTC by the Ministry of Finance of Vietnam in 2014 resulted in changes in the Vietnamese accounting regime, leading to adjustments in our database. Second, there has been an increase in the number of firms publishing their financial information post-2014.

We use ROA, ROE, and Tobin's Q to measure firm performance. Tobin's Q is defined as the ratio of market value of equity plus total debt and book value of total assets. Moreover, we calculate the logarithm of total assets, book-to-market, tangible assets, cash holding, long-term debt, equity, and dividend ratios. These measures are widely used in the literature (Xu and Liu, 2020; Xu and Li, 2022; and Le et al., 2023). To compute firm age, we use the natural logarithm of the number of years from the time the company is listed on the stock exchange.

We delete any firm-year observations with missing values of sale volume or total assets. To eliminate outliers, we winsorize at the 99th percentile. Our final sample includes 200 firms with 1,283 firm-year observations.

### 3.2. Measurement of IC variables

On the basis of existing literature (e.g., Chen et al., 2005; Nadeem et al., 2018; and Xu and Li, 2020), we utilize VAIC as a proxy for IC. Computation of VAIC involves two primary steps. For the first step, we evaluate a company's capacity to generate value added (VA) from all resources. VA is calculated as the disparity between output (OUT) and input (IN). Net sales signify the output, while all costs incurred in generating sales constitute the input (Tan et al., 2007; and Xu and Li, 2020).

$$VA = OUT - IN$$

The second step in estimating VAIC involves computing its three components: HCE, SCE, and CEE. For HCE, we follow Public (2000) to gather a firm's wage and compensation expenses. HCE is calculated as the ratio of VA to human capital (HC), representing the value generated per dollar spent on an employee.

$$HCE = VA / HC$$

Higher wages relative to VA indicate efficient use of HC, while lower HCE may suggest suboptimal utilization. Efficient use of HC enhances value addition through operating profit.

Structured capital (SC) includes strategies, organizational structures, patents, and brand names. SC is determined as the difference between VA and HC:

$$SC = VA - HC.$$

For SCE, we scale SC to total VA using the following formula:

$$SCE = SC / VA.$$

Pulic (2000) emphasizes that IC must be combined with physical and financial capital employed (CE) to create value. CE is calculated as the difference between total assets and intangible assets, indicating the added value created by a dollar spent on capital employed. CEE is computed as follows:

$$CEE = VA / CE.$$

Lastly, VAIC is derived by aggregating the three performance measures:

$$VAIC = HCE + SCE + CEE.$$

When a company efficiently utilizes its human, structural, physical, and financial capital, it adds value to the organization. A higher VAIC signifies more effective utilization of resources and greater value addition.

### 3.3. Descriptive statistics

Table 1 presents the descriptive statistics for the variables utilized in this study. The average ROA is 0.072, indicating that firms in our sample generate a net income equivalent to 7.20% of total assets. ROA ranges from a minimum of 4.50% to a maximum of 37.80%. Moreover, ROE spans from -8.90% to 49.40%, with an average of 14.10%. The third performance metric, Tobin's Q, varies from 0.359 to 6.332. These results are consistent with the figures in previous studies (e.g., Kweh et al., 2022)

\*\*\*insert Table 1\*\*\*

Table 1 also shows that VAIC varies from 2.565 to 7.159, with an average of 6.175. The mean value of HCE is 3.290, almost half of VAIC mean, underscoring its significant contribution to intellectual capital efficiency. However, SCE and CEE have an average value of only 0.512 and 0.180, respectively. Compared with the VAIC average of 6.175, these values suggest that companies in the sample exhibit limited interest in SCE and CEE.

In terms of control variables, the financial leverage ratio, calculated as total debt to total assets, spans from 2.90% to 85.90%, with an average of 48.80%. The logarithm of sales volume has an average value of 14.566. The average TANG is 0.326, indicating that the fixed assets of the sampled firms constitute approximately 32.60%. The average firm age is 7.39 years. Note that we compute firm age based on the time these firms were listed on the stock exchange. Given that Vietnamese stock markets are young, most firms were listed after 2007. On average, 97.60% of firms in our sample exhibit CEO duality, signifying that their CEOs also hold the position of chairman of the board of directors.

Before delving into the examination of the impact of IC on firm performance, we present the correlations among the primary variables in Table 2. The results reveal that VAIC and its three components exhibit significant correlations with three key measures of firm performance—ROA, ROE, and Tobin's Q. The p-values are below 0.001, signifying significance at the 1% level. Our research, aligning with previous studies (e.g., Chen et al., 2005; Nadeem et al., 2018; and Xu and Li, 2020), demonstrates that firms with high IC tend to outperform firms with relatively low IC in terms of profitability.

\*\*\*insert Table 2\*\*\*

Table 2 illustrates that VAIC is not significantly associated with firm leverage. However, it exhibits a significant positive correlation with firm sales volume but a negative correlation with firm age. This finding suggests that firms with large sales or younger firms tend to invest more in IC. The findings in Table 2 further indicate that ROE and Tobin's Q are negatively correlated with firm leverage. In addition, larger firms or those with high fixed assets tend to be more profitable. By contrast, firm age is negatively related to firm performance, implying that younger firms tend to perform better.

#### 4. MULTIVARIATE ANALYSIS

Table 2 shows the positive relationship between IC and firm performance. This section further investigates this relationship by using multivariate analysis techniques. Thereafter, we examine the effect of financial leverage on the relationship between IC and firm performance.

##### 4.1. Basic-line Regression Model

Following the current literature (e.g., Chen et al., 2005; Nadeem et al., 2018; and Xu and Li, 2020), we run the following regression to examine the effect of IC on firm performance:

$$\text{PERFORM}_{i,t+k} = \beta_0 + \beta_1 \text{IC}_{i,t} + \beta_2 \text{FIRM-CHAR}_{i,t} + \beta_3 \text{INDUSTRY-DUMMY}_{j,t} + \beta_4 \text{YEAR-DUMMY}_t + \varepsilon_{i,t} \quad (1)$$

where PERFORM is one of three measures of firm performance, which are ROA, ROE ratios, or Tobin's Q;  $k = 0$  or  $1$ ; IC is a measure of a firm's IC, which is either VAIC, HCE, SCE, or CEE; FIRM-CHAR is a set of firm characteristics; INDUSTRY-DUMMY is the industry dummy variable; and YEAR-DUMMY is the year dummy variable.

Current studies (e.g., Chen et al., 2005; Nadeem et al., 2018; and Xu and Li, 2020) highlight the influence of various variables, including sales, leverage, and firm age, on firm performance and VAIC. Therefore, our model incorporates controls for these variables. In particular, we account for firm size using the logarithm of sales volume, tangible assets, total debt ratios, and cash holdings. We also include controls for firm age and managerial power. To address industry-specific variations, we incorporate industry fixed-effects, recognizing that firm performance and VAIC may vary across industries. Time effects are also considered in our model to account for the influence of business cycles on firm performance, as documented in previous studies (e.g., Nadeem et al., 2018).

Given that we examine the impact of IC on firm performance, we focus on the coefficient of VAIC ( $\beta_1$ ). If this coefficient is different from 0, then we reject H1, which hypothesizes that IC is positively correlated with firm performance.

##### 4.2. The main results

Table 3 presents the results from the regression model of firm performance on VAIC and other control variables. In the first column, the coefficient of VAIC on ROA is 0.021, with a p-value of 0.00, which is statistically significant at the 1% level. This coefficient suggests that a one standard deviation increase in VAIC from the mean (0.952) will result in a 2.1% increase in ROA, controlling for other firm characteristics. In the second column, the coefficient of VAIC on ROE is 0.036, with a p-value of 0.00. This finding implies that a one standard deviation change in VAIC from the mean (0.952) will result in a 3.43% change in ROE. This effect is notably pronounced for Tobin's Q. This finding implies that investors focus considerably on firms with high IC.

The final three columns of Table 3 illustrate a positive correlation between VAIC and three indicators of future performance. The p-values are below 0.022, indicating significance at the conventional levels. However, the coefficients of VAIC on accounting-based performance, specifically ROA and ROE, are comparatively smaller. By contrast, the coefficient of VAIC on Tobin's Q, a market-based performance measure, is higher than those in the initial three columns. These findings suggest that investors require time to acknowledge the impact of a firm's investment in IC.

\*\*\* insert table 3 here\*\*\*

Table 3 further illustrates the impact of firm characteristics on performance. In particular, firm leverage exhibits a negative correlation with ROA and Tobin's Q. However, this effect is not statistically significant for ROE. In addition, older firms or those with substantial tangible assets tend to exhibit poorer performance. Conversely, firms with higher sales or greater cash holdings are associated with enhanced performance.

To further investigate the impact of VAIC on firm performance, we utilize a regression model to analyze the effects of its individual components. Table 4 presents the outcomes and indicates that HCE is significantly correlated with ROA and ROE, with p-values below 0.024, signifying significance at the conventional levels. However, HCE demonstrates an insignificant relationship with Tobin's Q. Similarly, SCE is also positively related to ROA and ROE, but insignificantly correlated with Tobin's Q. By contrast, CEE significantly influences the three measures of firm performance. These findings align with prior studies, such as those by Nadeem et al. (2018) and Xu et al. (2017).

\*\*\* insert table 4 here\*\*\*

### 4.3. IC, financial leverage, and firm performance

As discussed in many textbooks, financing decisions play a pivotal role in shaping a company's capital structure and, consequently, its overall performance. Firms often utilize a combination of debt and equity to fund their operations, investments, and growth initiatives. The choice between debt and equity financing can significantly impact a company's financial health, risk profile, and cost of capital. Effective financial management, including prudent debt management and strategic capital allocation, can enhance a firm's ability to generate returns for its shareholders. Conversely, excessive debt or inadequate financing may lead to financial distress, increased costs of capital, and, ultimately, poor performance. The dynamic interplay between financing choices and firm performance underscores the importance of sound financial decision-making in the corporate world.

This section investigates the impact of financial leverage on the correlation between IC and firm performance. To explore this aspect, we conduct the following regression model:

$$\text{PERFORM}_{i,t+k} = \beta_0 + \beta_1 \text{IC}_{i,t} + \beta_2 \text{VAIC}_{i,t} * \text{LEV}_{i,t} + \beta_3 \text{FIRM-CHAR}_{i,t} + \beta_4 \text{INDUSTRY-DUMMY}_{j,t} + \beta_5 \text{YEAR-DUMMY}_t + \varepsilon_{i,t}, \quad (2)$$

where LEV is firm leverage.

In assessing the role of financial leverage in influencing the correlation between IC and firm performance, our attention centers on the coefficient of the interaction terms of VAIC and financial leverage ( $\beta_2$ ). Should financial leverage augment the impact of IC on firm performance, we anticipate a significant and positive coefficient. Conversely, a negative or insignificant coefficient would suggest otherwise.

\*\*\* insert table 5 here\*\*\*

Table 5 presents the findings on the influence of the total debt ratio on the association between IC and firm performance. Our analysis reveals that the coefficients of the interaction term involving the total leverage ratio and VAIC exhibit a significant correlation with ROA and Tobin's Q, with p-values below 0.04, signifying significance at conventional levels. Note that these coefficients are negative, suggesting that the impact of VAIC on firm performance is minimally pronounced for companies with high debt. Of significance is that when compared with the results in Table 3, the effects of VAIC on future firm performance in Table 5 appear weaker. These results indicate that total debt acts as a moderating factor in the relationship between IC and firm performance.

To further investigate the moderating role of financial leverage, we specifically analyze the influence of long-term debt separately from that of short-term leverage on the correlation between IC and firm performance. The results of these analyses are presented in Table 6.

\*\*\* insert table 6 here\*\*\*

The outcomes presented in Table 6 reveal a significant correlation between the interactions and ROA and Tobin's Q. The coefficients exhibit a negative trend, suggesting that the impact of IC on firm performance is moderated by long- and short-term debts. However, note that this moderation effect is relatively weak when considering future firm performance.

Debt plays a dual role in influencing the relationship between IC and firm performance, with positive and negative effects. On the positive side, debt imposes financial discipline, encouraging efficient resource allocation and fostering IC efficiency by driving a markedly focused approach to value-generating initiatives. Conversely, excessive debt can have detrimental effects, diverting funds toward servicing obligations and creating a "debt overhang" that limits a firm's ability to pursue long-term investments in IC. High leverage also restricts managerial flexibility and fosters risk-averse behavior, all of which undermine the positive impact of IC on firm performance. Excessive financial constraints can further erode stakeholder confidence and reduce the firm's capacity to capitalize on its IC potential.

\*\*\* insert table 7 here\*\*\*

To examine these mechanisms, we analyze the linear and nonlinear effects of debt on the IC–performance relationship. We modify regression model 1 by adding squared leverage ratio and the interaction term of IC and squared leverage ratio. Including squared leverage captures potential nonlinear effects of leverage on firm performance, enables identification of an optimal leverage level, and prevents omitted variable bias owing to an incorrect functional form. Furthermore, it also aligns with established theoretical frameworks and empirical literature in corporate finance.

The results in Table 7 indicate that the coefficients of the interaction terms between IC and squared leverage are insignificant, suggesting a linear effect of debt. We mean-centered the leverage variable because the interaction terms of IC and leverage, IC and squared leverage, and squared leverage are highly multicollinear (VIFs > 29). After this adjustment, the coefficient of the interaction between IC and squared leverage remains insignificant, confirming that the effect of debt on the relationship between IC and firm performance is linear.

\*\*\* insert figure 1 here\*\*\*

To visualize the influence of leverage on the relationship between IC and firm performance, we compute the marginal effects of IC on firm performance across different levels of total debt ratio. Figure 1 shows that the marginal effects of IC on ROA, ROE, and Tobin's Q decrease as financial leverage increases. Moreover, these marginal effects appear visually linear with respect to leverage, suggesting that the impact of IC on firm performance declines steadily as leverage rises.

#### **4.4. Robustness tests**

##### **4.4.1. Generalized Method of Moments**

Consistent with prior literature exploring the association between IC and firm performance (e.g., Nadeem et al., 2018; and Singla, 2020), we utilize the fixed-effect (FE) regression model to examine the impact of IC on firm performance, as well as the influence of financial leverage on the relationship between IC and firm performance. However, certain studies (e.g., Wintoki et al., 2012; Nadeem et al., 2018) have highlighted the advantages of the generalized method of moments (GMM) estimation method over FE. For example, GMM enables the current IC to be influenced by the past, and the GMM estimator can use a firm's historical data as valid instruments to address endogeneity concerns (Nadeem et al., 2018). This method is particularly suitable for panel data characterized by a short period but many elements.

This section conducts a robust examination of the primary findings in this study using the GMM estimation. Table 8 illustrates that VAIC is significantly and positively correlated with ROA, ROE, and Tobin's Q. Note that the impact of VAIC on firm future performance is more pronounced than the results presented in Table 3. In addition, akin to the outcomes in Table 3, Table 8 indicates that older firms or those with high leverage tend to exhibit poorer performance. By contrast, firms with high sales volume or substantial cash holdings tend to demonstrate higher profitability.

\*\*\* insert table 8 here\*\*\*

We re-evaluate the impact of financial leverage on the correlation between IC and firm performance using GMM estimation and present the findings in Table 8. Similar to the outcomes in Table 5, Table 8 indicates a significant correlation between the interactions of VAIC and leverage with firm performance. Note that the coefficients in Table 8 are more substantial, suggesting that the influence of financial leverage is more pronounced under the GMM estimation.

\*\*\* insert table 9 here\*\*\*

Different from the results in Table 5, Table 9 reveals a significant and negative correlation between the interactions of VAIC and leverage with all three measures of firm performance: ROA, ROE,

and Tobin's Q. These results show that H2 that leverage insignificantly impacts the relationship between IC and firm performance is rejected. That is, financial leverage can moderate this relation.

#### **4.4.2. Financial leverage, IC, and firm performance in non-manufacturing industries**

Firms in different industries exhibit distinct core operations and characteristics, thereby influencing their IC efficiency. Prior studies, such as Xu and Li (2022), have shown that manufacturing sectors often have high knowledge intensity and IC efficiency, while other sectors, such as agriculture (Jin and Xu, 2022), banking (Vo and Tran 2021; and Ting et al., 2022), and tourism (Dalwai and Sewpersadh, 2023), present varying IC–performance dynamics. To test the robustness of our findings and explore sectoral heterogeneity in Vietnam, we focus on non-manufacturing and technology sectors,<sup>2</sup> which are increasingly vital to Vietnam's economy.

\*\*\* insert table 10 here\*\*\*

This section re-estimates Model (2) for firms in these sectors and report the results in Table 10. Consistent with Table 5, the results show a significant positive correlation between IC (measured by VAIC) and firm performance (ROA, ROE, and Tobin's Q) in non-manufacturing and technology firms. However, this positive relationship is significantly moderated by financial leverage, with the effect of IC on performance being less pronounced in firms with higher debt levels. This evidence supports H2, confirming that relatively high financial leverage weakens the IC-performance relationship across sectors, with implications for capital structure optimization in Vietnam's emerging market.

## **5. CONCLUSION, CONTRIBUTIONS, LIMITATIONS, AND FUTURE RESEARCH DIRECTION**

This study investigates the impact of (1) IC and its components on firm performance, and (2) financial leverage on the relationship between IC and firm performance, utilizing data from the top 200 companies listed on the Vietnamese stock market, comprising 1,298 observations spanning from 2015 to 2021. Our analysis reveals significant correlations between IC and its components with three performance metrics: ROA, ROE, and Tobin's Q. These findings align with existing literature, as evidenced by Xu et al. (2017) and Nadeem et al. (2018). Furthermore, our conclusions are consistent with the principles outlined in RBV and production theory.

As highlighted in the literature and finance textbooks, financial resources play a significant role in a firm's development. Accordingly, our study explores the influence of capital structure on the relationship between IC and firm performance. Our findings reveal that a firm's debt moderates this relationship, with the impact of IC on firm performance being minimally pronounced for firms with high levels of debt. This conclusion applies to long- and short-term debts.

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<sup>2</sup> We also examine the effect of financial leverage on the relationship between IC and firm performance in the manufacturing and technology industries. The results show that the marginal effect of IC on firm performance declines as leverage increases.

Overall, our study underscores the crucial role of IC in enhancing firm performance while highlighting the moderating effect of financial leverage on this relationship.

The findings presented in this study hold significant implications for corporate governance and policymakers alike. First, our study suggests that policymakers could foster an environment conducive to investments in IC, recognizing its pivotal role in enhancing firms' effectiveness in value creation. Furthermore, policymakers are urged to consider the costs associated with staffing, administration, and sales, because these factors contribute to value creation. From a human capital perspective, prioritizing continuous training and development programs for employees is crucial for enhancing their capacity, thereby bolstering company performance. In addition, policymakers may explore such avenues as allocating additional employee benefits and salary increases to boost employee motivation, including incentives for equity or profit sharing.

From the structural capital front, policymakers are advised to continuously monitor and enhance related strategies, policies, and procedures, given that these resources form the backbone of smooth and successful operations, thereby enhancing overall company efficiency. Moreover, managers should focus on improving internal infrastructure, including knowledge-based infrastructure, customer support, administrative processes, innovation capital, quality, organizational management models, and social and environmental commitments.

Second, our findings highlight the importance of equity financing in enhancing the positive effect of IC on firm performance, because high leverage weakens this relationship. To strengthen Vietnam's capital market, policymakers should promote dynamic stock market mechanisms to improve firms' access to equity financing and foster transparent corporate governance to attract institutional investors. These measures can reduce reliance on debt, thereby mitigating the constraints of excessive leverage. In addition, regulators should implement monitoring frameworks to curb over-borrowing, balancing creditor oversight with managerial flexibility to support innovative IC strategies.

This study's insights extend to other emerging markets, in which underdeveloped capital markets amplify leverage risks, thereby guiding firms toward optimal capital structures that maximize IC efficiency. By prioritizing equity financing, firms pursuing ambitious IC strategies can enhance performance without the limitations imposed by high debt and creditor restrictions.

This study has a few limitations benefits (ROA), return on equity (ROE), and Tobin's Q as proxies for firm performance, potentially overlooking insights from a broader range of metrics, such as market share or operational efficiency. In addition, incorporating surveys and interviews with industry experts and managers could provide valuable qualitative perspectives on IC's impact. To enhance the robustness of future research, it would be beneficial to explore alternative profitability measures (e.g., economic value added), integrate expert opinions alongside secondary data, and examine sectoral heterogeneity (e.g., comparing technology, manufacturing, and service sectors) to determine industry-specific IC dynamics. Lastly, utilizing alternative IC measures, such as innovation capital (e.g., patent-based metrics) or relational capital (e.g., customer network

strength), could offer profound insights into the nuanced effects of IC on firm performance in Vietnam's emerging market context.

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**Appendix: Variable definition**


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**Firm Performance**

ROA	Return on assets which is equal to the ratio of net income to total assets
ROE	Return on equity which is equal to the ratio of net income to total equity
TOBINQ	Tobin's Q, which is equal to the market value of equity plus total debt to book value of total assets

**Intellectual Capital**

VAIC	Value-added intellectual coefficient (in logarithm) which is the sum of HCE, SCE, and CEE
HCE	Human capital efficiency which is calculated in section 3.2.
SCE	Structural capital efficiency which is calculated in section 3.2.
CEE	Capital employed efficiency which is calculated in section 3.2.

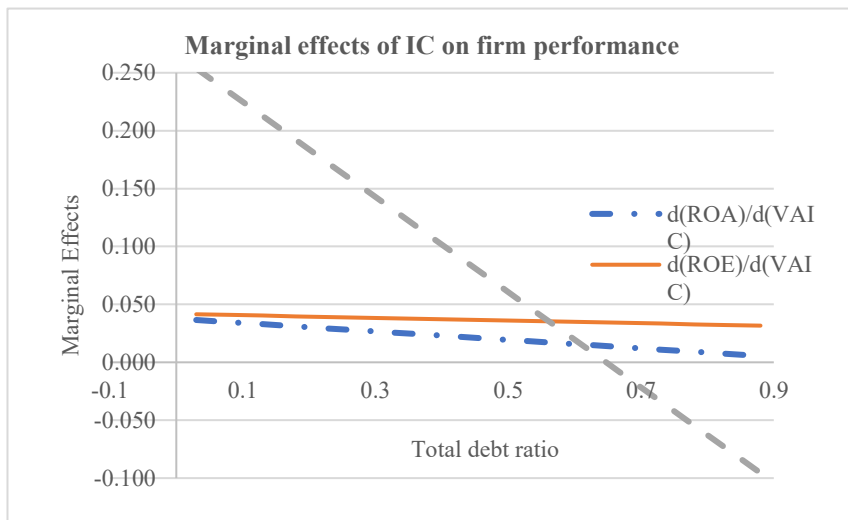
**Firm Characteristics**

LEV	The ratio of total debt to total assets
LSALE	The natural logarithm of total sale volume
TANG	The ratio of tangible assets to total assets
CASH	The ratio of cash holdings to total assets
LAGE	The natural logarithm of firm age until 2021
CEODUAL	Dummy variable which is equal to 1 if the firm's CEO is the chairman of the firm's board of directors and 0 otherwise

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**Figure 1: Marginal Effects of Intellectual Capital on Firm Performance and Leverage**

This figure plots the marginal effects of intellectual capital on firm performance for different levels of financial leverage.



**Table 1: Descriptive statistics**

Variable	Mean	Std	MIN	25th	50th	75th	MAX	N
<b>FIRM PERFORMANCE</b>								
ROA	0.072	0.068	-0.045	0.024	0.057	0.097	0.378	1,283
ROE	0.141	0.110	-0.089	0.060	0.128	0.199	0.494	1,283
TOBINQ	1.347	0.849	0.359	0.918	1.124	1.474	6.332	1,283
<b>INTELLECTUAL CAPITAL</b>								
VAIC	6.175	0.952	2.565	5.775	6.469	6.879	7.159	1,283
HCE	3.290	3.442	-0.620	1.440	2.070	3.720	20.270	1,283
SCE	0.512	0.368	-1.180	0.319	0.532	0.749	1.955	1,283
CEE	0.180	0.157	-0.011	0.069	0.137	0.251	0.809	1,283
<b>FIRM CHARACTERISTICS</b>								
LEV	0.488	0.201	0.029	0.333	0.512	0.648	0.859	1,283
LSALE	14.566	1.468	10.078	13.628	14.561	15.409	18.442	1,283
TANG	0.326	0.373	0.001	0.055	0.196	0.451	1.775	1,283
CASH	0.078	0.083	0.000	0.021	0.050	0.107	0.472	1,283
LAGE	2.022	0.682	0.000	1.792	2.197	2.485	3.091	1,283
CEODUAL	0.796	0.403	0.000	1.000	1.000	1.000	1.000	1,283

Notes: This table summarizes the descriptive statistics for the main variables for firms in our sample. All variables are defined in Appendix 1. All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles

**Table 2: Correlation matrix**

	LVAIC	HCE	SCE	CEE	ROE	ROA	TOBINQ	LEV	LSALE	TANG	CASH	LAGE
HCE	0.277***											
SCE	0.510***	0.492***										
CEE	0.050*	-0.098***	-0.125***									
ROE	0.313***	0.243***	0.212***	0.587***								
ROA	0.297***	0.273***	0.198***	0.663***	0.845***							
TOBINQ	0.125***	0.124***	0.072***	0.523***	0.507***	0.634***						
LEV	0.031	-0.100***	0.020	-0.224***	-0.002	-0.400***	-0.218***					
LSALE	0.092***	0.001	0.067**	0.165***	0.227***	0.104***	0.191***	0.287***				
TANG8	0.048*	-0.031	-0.014	0.174***	0.061**	0.180***	0.087***	-0.194***	0.051*			
CASH	-0.017	-0.034	-0.050*	0.281***	0.240***	0.242***	0.153***	-0.084***	0.161***	-0.042		
LAGE	-0.105***	-0.138***	-0.113***	-0.017	-0.123***	-0.086***	-0.153***	-0.005	0.029	0.080***	-0.044	
CEODUAL	-0.067**	0.020	-0.022	0.013	-0.001	0.026	0.081***	-0.019	0.081***	0.132***	0.038	0.077***

*Notes:* This table presents the correlations among variables used in the paper. All variables are defined in the appendix. All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. The \*, \*\*, and \*\*\* denote statistical significance at 10%, 5% and 1% levels, respectively.

**Table 3: Intellectual Capital and Firm Performance**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
VAIC <sub>t</sub>	0.021*** (0.000)	0.036*** (0.000)	0.081* (0.055)	0.017*** (0.000)	0.025*** (0.000)	0.093** (0.022)
LEV <sub>t</sub>	-0.132*** (0.000)	0.001 (0.977)	-1.083*** (0.002)	-0.098*** (0.000)	0.031 (0.285)	-1.013*** (0.002)
LSALE <sub>t</sub>	0.006** (0.012)	0.009** (0.027)	0.127** (0.017)	0.004 (0.149)	0.005 (0.221)	0.130** (0.014)
TANG <sub>t</sub>	-0.006 (0.490)	-0.019 (0.219)	-0.306*** (0.010)	-0.004 (0.707)	-0.018 (0.313)	-0.330*** (0.008)
CASH <sub>t</sub>	0.124*** (0.001)	0.239*** (0.000)	0.650 (0.222)	0.126*** (0.002)	0.241*** (0.000)	0.807 (0.146)
LAGE <sub>t</sub>	-0.006 (0.202)	-0.015** (0.041)	-0.228** (0.011)	-0.003 (0.494)	-0.009 (0.222)	-0.173** (0.036)
CEODUAL <sub>t</sub>	-0.000 (0.933)	-0.004 (0.697)	0.096 (0.158)	-0.006 (0.291)	-0.015 (0.123)	0.075 (0.297)
Intercept	-0.076** (0.046)	-0.198*** (0.001)	-0.228 (0.756)	-0.046 (0.267)	-0.098 (0.144)	-0.423 (0.563)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	1,283	1,283	1,283	1,072	1,072	1,072
Adj. <i>R</i> <sup>2</sup>	0.3837	0.2459	0.2267	0.3035	0.1796	0.2244

Notes: This table reports the results from the regression model (1). All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively.

**Table 4: Components of Intellectual Capital and Firm Performance**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
HCE <sub>t</sub>	0.004*** (0.000)	0.008*** (0.000)	0.026 (0.125)	0.003** (0.018)	0.004** (0.024)	0.028 (0.124)
SCE <sub>t</sub>	0.024*** (0.001)	0.043*** (0.002)	0.086 (0.329)	0.033*** (0.000)	0.054*** (0.001)	0.141 (0.213)
CEE <sub>t</sub>	0.272*** (0.000)	0.446*** (0.000)	2.609*** (0.000)	0.240*** (0.000)	0.381*** (0.000)	2.471*** (0.000)
LEV <sub>t</sub>	-0.080*** (0.000)	0.087*** (0.000)	-0.628** (0.028)	-0.054*** (0.000)	0.099*** (0.000)	-0.573** (0.034)
LSALE <sub>t</sub>	0.004** (0.030)	0.006* (0.054)	0.104** (0.038)	0.002 (0.277)	0.003 (0.399)	0.111** (0.027)
TANG <sub>t</sub>	-0.000 (0.944)	-0.008 (0.365)	-0.271*** (0.008)	0.000 (0.964)	-0.012 (0.271)	-0.289*** (0.006)
CASH <sub>t</sub>	0.032 (0.219)	0.090** (0.032)	-0.281 (0.608)	0.044 (0.200)	0.112** (0.046)	-0.065 (0.903)
LAGE <sub>t</sub>	-0.001 (0.605)	-0.008 (0.116)	-0.190** (0.017)	0.000 (0.937)	-0.003 (0.512)	-0.138* (0.054)
CEODUAL <sub>t</sub>	-0.001 (0.730)	-0.006 (0.456)	0.111* (0.091)	-0.006 (0.206)	-0.015* (0.070)	0.091 (0.191)
Intercept	-0.022 (0.387)	-0.099** (0.013)	-0.229 (0.709)	-0.008 (0.773)	-0.051 (0.254)	-0.398 (0.527)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,283	1,283	1,283	1,072	1,072	1,072
Adj. R <sup>2</sup>	0.6551	0.5197	0.3868	0.5290	0.3996	0.3781

Notes: This table reports the results from the regression model (1). All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively.

**Table 5: Financial Leverage, Intellectual Capital and Firm Performance**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
VAIC <sub>t</sub>	0.038*** (0.000)	0.042*** (0.000)	0.277*** (0.008)	0.039** (0.028)	0.052* (0.067)	0.145** (0.037)
VAIC* LEV <sub>t</sub>	-0.037*** (0.004)	-0.011 (0.575)	-0.425** (0.012)	-0.043* (0.057)	-0.050 (0.194)	-0.193* (0.061)
LEV <sub>t</sub>	0.090 (0.211)	0.068 (0.549)	1.484 (0.116)	0.176* (0.052)	0.356* (0.052)	1.333* (0.052)
LSALE <sub>t</sub>	0.006** (0.015)	0.009** (0.030)	0.122** (0.018)	-0.005 (0.150)	-0.012** (0.036)	-0.080 (0.258)
TANG <sub>t</sub>	-0.006 (0.483)	-0.019 (0.218)	-0.304*** (0.008)	-0.003 (0.725)	-0.016 (0.369)	-0.033 (0.766)
CASH <sub>t</sub>	0.120*** (0.000)	0.238*** (0.000)	0.607 (0.249)	0.131** (0.010)	0.251*** (0.003)	0.327 (0.375)
LAGE <sub>t</sub>	-0.007 (0.138)	-0.015** (0.040)	-0.238*** (0.008)	-0.004 (0.462)	-0.010 (0.219)	-0.230 (0.102)
CEODUAL <sub>t</sub>	0.001 (0.857)	-0.003 (0.732)	0.112 (0.106)	-0.000 (0.962)	-0.005 (0.599)	0.017 (0.742)
Intercept	-0.172*** (0.000)	-0.227*** (0.001)	-1.337 (0.169)	-0.055 (0.579)	-0.030 (0.862)	1.888* (0.098)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	1,283	1,283	1,283	1,072	1,072	1,072
Adj. <i>R</i> <sup>2</sup>	0.3968	0.2457	0.2377	0.3251	0.1988	0.8063

Notes: This table reports the results from the regression model (2). All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively

**Table 6: Debt, Intellectual Capital, and Firm Performance**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
VAIC <sub>t</sub>	0.037*** (0.000)	0.042*** (0.000)	0.278*** (0.006)	0.036** (0.018)	0.046** (0.047)	0.132* (0.054)
VAIC* LTD <sub>t</sub>	-0.040*** (0.004)	-0.038 (0.182)	-0.330* (0.078)	-0.040* (0.056)	-0.029 (0.181)	-0.352** (0.026)
LTD <sub>t</sub>	0.068 (0.373)	0.140 (0.431)	0.673 (0.524)	0.100 (0.127)	0.111 (0.224)	2.066** (0.042)
VAIC* STD <sub>t</sub>	-0.031** (0.017)	0.001 (0.967)	-0.459*** (0.007)	-0.039** (0.049)	-0.048 (0.178)	-0.094 (0.387)
STD <sub>t</sub>	0.073 (0.316)	0.048 (0.703)	1.788* (0.064)	0.155* (0.074)	0.364** (0.041)	0.706 (0.338)
LSALE <sub>t</sub>	0.005** (0.037)	0.006 (0.105)	0.118** (0.023)	0.003 (0.401)	0.003 (0.502)	0.050 (0.263)
TANG <sub>t</sub>	-0.004 (0.660)	-0.012 (0.426)	-0.293** (0.011)	-0.001 (0.889)	-0.011 (0.534)	-0.000 (0.996)
CASH <sub>t</sub>	0.110*** (0.002)	0.213*** (0.001)	0.564 (0.294)	0.112* (0.060)	0.215** (0.031)	0.253 (0.516)
LAGE <sub>t</sub>	-0.007 (0.120)	-0.016** (0.025)	-0.240*** (0.007)	-0.004 (0.440)	-0.011 (0.173)	-0.237* (0.077)
CEODUAL <sub>t</sub>	0.003 (0.592)	0.002 (0.838)	0.122* (0.085)	-0.002 (0.675)	-0.009 (0.432)	0.011 (0.826)
Intercept	-0.155*** (0.000)	-0.203*** (0.005)	-1.293 (0.184)	-0.140 (0.107)	-0.192 (0.183)	0.127 (0.872)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,283	1,283	1,283	1,072	1,072	1,072
Adj. R <sup>2</sup>	0.4055	0.2713	0.2387	0.3308	0.2081	0.8074

Notes: This table reports the results from the regression model (2). All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively.

**Table 7: Nonlinear Effect of Financial Leverage**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
VAIC <sub>t</sub>	0.041*** (0.000)	0.044*** (0.000)	0.282*** (0.000)	0.041*** (0.000)	0.040*** (0.000)	0.374*** (0.000)
VAIC <sub>t</sub> *LEV <sub>t</sub>	-0.057** (0.035)	-0.017 (0.733)	-0.414 (0.273)	-0.067** (0.027)	0.015 (0.780)	-0.692* (0.085)
VAIC <sub>t</sub> *LEV <sub>t</sub> *LEV <sub>t</sub>	0.023 (0.445)	0.004 (0.935)	-0.020 (0.962)	0.028 (0.405)	-0.075 (0.202)	0.180 (0.680)
LEV <sub>t</sub>	0.197 (0.227)	-0.054 (0.856)	0.809 (0.724)	0.288 (0.119)	-0.211 (0.522)	2.450 (0.315)
LEV <sub>t</sub> *LEV <sub>t</sub>	-0.123 (0.495)	0.142 (0.665)	0.783 (0.758)	-0.145 (0.472)	0.618* (0.086)	-0.317 (0.905)
LSALE <sub>t</sub>	0.006*** (0.000)	0.009*** (0.000)	0.124*** (0.000)	0.003** (0.015)	0.006** (0.022)	0.126*** (0.000)
TANG <sub>t</sub>	-0.006 (0.275)	-0.019* (0.064)	-0.306*** (0.000)	-0.004 (0.572)	-0.019 (0.112)	-0.329*** (0.000)
CASH <sub>t</sub>	0.120*** (0.000)	0.245*** (0.000)	0.633** (0.017)	0.122*** (0.000)	0.243*** (0.000)	0.785*** (0.006)
LAGE <sub>t</sub>	-0.007*** (0.005)	-0.015*** (0.001)	-0.236*** (0.000)	-0.004 (0.112)	-0.010** (0.037)	-0.183*** (0.000)
CEODUAL <sub>t</sub>	0.001 (0.826)	-0.004 (0.573)	0.110** (0.044)	-0.004 (0.315)	-0.014* (0.073)	0.096* (0.090)
Intercept	-0.188*** (0.000)	-0.222*** (0.000)	-1.292*** (0.008)	-0.179*** (0.000)	-0.165** (0.018)	-1.919*** (0.000)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,283	1,283	1,283	1,072	1,072	1,072
adj. R <sup>2</sup>	0.3962	0.2486	0.2376	0.3209	0.1925	0.2420

Notes: This table reports the results from the regression model (2). All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively.

**Table 8: Intellectual Capital and Firm Performance with GMM Estimation**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
VAIC <sub>t</sub>	0.020*** (0.000)	0.034*** (0.000)	0.089*** (0.000)	0.018*** (0.000)	0.025*** (0.000)	0.097*** (0.000)
LEV <sub>t</sub>	-0.143*** (0.000)	-0.020 (0.247)	-1.184*** (0.000)	-0.110*** (0.000)	0.012 (0.531)	-1.106*** (0.000)
LSALE <sub>t</sub>	0.008*** (0.000)	0.013*** (0.000)	0.142*** (0.000)	0.005*** (0.000)	0.009*** (0.001)	0.141*** (0.000)
TANG <sub>t</sub>	0.016*** (0.000)	0.014* (0.056)	0.050 (0.336)	0.022*** (0.000)	0.018** (0.023)	0.060 (0.311)
CASH <sub>t</sub>	0.151*** (0.000)	0.282*** (0.000)	0.854*** (0.002)	0.155*** (0.000)	0.285*** (0.000)	1.031*** (0.001)
LAGE <sub>t</sub>	-0.006** (0.013)	-0.015*** (0.000)	-0.192*** (0.000)	-0.002 (0.400)	-0.007 (0.106)	-0.138*** (0.002)
CEODUAL <sub>t</sub>	0.002 (0.651)	-0.001 (0.869)	0.143*** (0.001)	-0.002 (0.680)	-0.009 (0.190)	0.126*** (0.005)
Intercept	-0.103*** (0.000)	-0.247*** (0.000)	-0.505 (0.130)	-0.075*** (0.001)	-0.153*** (0.000)	-0.682* (0.051)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,283	1,283	1,283	1,072	1,072	1,072

Notes: This table reports the results from the regression model (1) with GMM estimation. All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively.

**Table 9: Intellectual Capital and Firm Performance with GMM Estimation**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
VAIC <sub>t</sub>	0.041*** (0.000)	0.044*** (0.000)	0.327*** (0.000)	0.041*** (0.000)	0.052*** (0.000)	0.375*** (0.000)
VAIC* LEV <sub>t</sub>	-0.044*** (0.000)	-0.023 (0.154)	-0.520*** (0.000)	-0.050*** (0.000)	-0.059*** (0.002)	-0.599*** (0.000)
LEV <sub>t</sub>	0.124*** (0.004)	0.120 (0.226)	1.957*** (0.001)	0.189*** (0.000)	0.366*** (0.002)	2.502*** (0.000)
LSALE <sub>t</sub>	0.007*** (0.000)	0.013*** (0.000)	0.137*** (0.000)	0.004*** (0.001)	0.008*** (0.001)	0.134*** (0.000)
TANG <sub>t</sub>	0.014*** (0.002)	0.013* (0.074)	0.030 (0.567)	0.019*** (0.000)	0.015* (0.051)	0.034 (0.568)
CASH <sub>t</sub>	0.146*** (0.000)	0.279*** (0.000)	0.791*** (0.005)	0.148*** (0.000)	0.277*** (0.000)	0.953*** (0.002)
LAGE <sub>t</sub>	-0.007*** (0.006)	-0.015*** (0.000)	-0.198*** (0.000)	-0.003 (0.284)	-0.008* (0.076)	-0.145*** (0.001)
CEODUAL <sub>t</sub>	0.003 (0.457)	-0.001 (0.936)	0.156*** (0.000)	-0.000 (0.993)	-0.007 (0.309)	0.146*** (0.001)
Intercept	-0.217*** (0.000)	-0.306*** (0.000)	-1.844*** (0.000)	-0.204*** (0.000)	-0.306*** (0.000)	-2.234*** (0.000)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,283	1,283	1,283	1,072	1,072	1,072

Notes: This table reports the results from the regression model (1) with GMM estimation. All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively.

**Table 10: Intellectual Capital and Firm Performance in Non-manufacturing Industries**

	ROA <sub>t</sub>	ROE <sub>t</sub>	TOBINQ <sub>t</sub>	ROA <sub>t+1</sub>	ROE <sub>t+1</sub>	TOBINQ <sub>t+1</sub>
VAIC <sub>t</sub>	0.031*** (0.000)	0.033*** (0.000)	0.094* (0.082)	0.027*** (0.000)	0.028*** (0.002)	0.196*** (0.001)
VAIC* LEV <sub>t</sub>	-0.036*** (0.000)	-0.015 (0.302)	-0.140 (0.175)	-0.033*** (0.001)	-0.019 (0.247)	-0.286** (0.010)
LEV <sub>t</sub>	0.125** (0.019)	0.124 (0.188)	0.366 (0.572)	0.150** (0.013)	0.207** (0.047)	1.475** (0.033)
LSALE <sub>t</sub>	0.002 (0.237)	0.005* (0.071)	0.075*** (0.000)	-0.010*** (0.000)	-0.018*** (0.000)	0.018 (0.420)
TANG <sub>t</sub>	0.008 (0.268)	0.009 (0.519)	-0.231** (0.014)	0.006 (0.472)	0.006 (0.714)	-0.211** (0.042)
CASH <sub>t</sub>	0.126*** (0.000)	0.250*** (0.000)	0.507* (0.099)	0.111*** (0.000)	0.243*** (0.000)	0.757** (0.016)
LAGE <sub>t</sub>	-0.010*** (0.000)	-0.021*** (0.000)	-0.305*** (0.000)	-0.006** (0.039)	-0.013*** (0.009)	-0.251*** (0.000)
CEODUAL <sub>t</sub>	-0.000 (0.933)	-0.006 (0.466)	0.049 (0.418)	-0.000 (0.987)	-0.004 (0.650)	0.055 (0.380)
Intercept	-0.103*** (0.002)	-0.144** (0.015)	0.236 (0.561)	0.066 (0.121)	0.178** (0.016)	0.135 (0.782)
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	791	791	791	655	655	655
Adj. R <sup>2</sup>	0.3678	0.2248	0.2504	0.3332	0.2086	0.2310

Notes: This table reports the results from the regression model (2) for firms in non-manufacturing and technology industries. All variables are winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles. P-values are in parentheses. \*\*\*, \*\*, and \* denotes statistical significance at 1%, 5%, and 10%, respectively.