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INVENTORY MANAGEMENT AND FIRM PERFORMANCE NEXUS: THE INFLUENCE OF CAPITAL INTENSITY

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ABSTRACT

This study investigates the relationship between inventory management and firm performance, with a focus on the mediating role of capital intensity in manufacturing firms listed on Vietnam's three major stock exchanges. Using a dataset spanning 2013–2023 from the website https://vietstock.vn/, the study employs a multiple regression framework to analyze the impact of inventory turnover, inventory days, on firm performance, measured by return on assets (ROA) and return on equity (ROE), and the impact of capital intensity on this relationship. The findings reveal that efficient inventory management positively influences firm performance, while longer inventory holding periods negatively impact profitability. Capital intensity is identified as a significant mediator, amplifying the positive effects of inventory practices on performance, despite its standalone negative influence. Control variables, such as liquidity, firm size, and leverage, further contextualize the results. This study contributes to the literature by integrating capital intensity as a mediator, offering insights into the inventory-performance nexus in the context of an emerging market. The findings provide practical implications for firms to align inventory strategies with capital investments for improved operational efficiency and competitiveness.

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1. Introduction

Effective inventory management has long been recognized as a critical determinant of firm performance. Firms strive to balance inventory levels to ensure operational efficiency and cost minimization, while also meeting market demands. However, inventory management is a multifaceted challenge, influenced by various internal and external factors. Among these, capital intensity—measured as the ratio of fixed assets to total assets—has emerged as a potential mediator in understanding how inventory practices affect firm performance. While studies have explored the inventory-performance relationship (Koumanakos, 2008; Cannon, 2008), limited attention has been given to the role of capital intensity, especially in emerging markets like Vietnam. This gap in the literature calls for a deeper examination of how capital intensity influences the inventory-performance nexus.

Recent research has increasingly highlighted the importance of contextual factors, such as industry characteristics, firm size, and market conditions, in shaping the impact of inventory management on firm performance. For example, Rajagopalan and Malhotra (2001) demonstrated the variability of inventory strategies across industries, while Chen et al. (2005) emphasized the role of market conditions in inventory decisions. In the Vietnamese context, Nguyen and Dang (2020), and Nguyen and Nguyen (2020) found significant correlations between inventory practices and profitability in manufacturing firms. However, these studies often lack a comprehensive theoretical framework or fail to incorporate mediating variables like capital intensity, leaving a gap in understanding the nuanced dynamics of inventory management. This study addresses this gap by investigating the mediating role of capital intensity, offering new insights into an underexplored area of research.

The significance of this research lies in its potential to advance both academic understanding and practical decision-making. From an academic perspective, the study contributes to the literature by integrating capital intensity as a mediator in the inventory-performance relationship, thereby addressing gaps identified in previous research. Practically, the findings can guide managers in optimizing their inventory strategies by considering the structural implications of capital investments. In the context of Vietnam, where the manufacturing sector plays a pivotal role in economic growth, these insights are particularly relevant for improving competitiveness and operational efficiency.

The primary objective of this research is to examine the mediating role of capital intensity in the relationship between inventory management and firm performance in Vietnam's manufacturing sector. The study employs a multiple regression framework to analyze data from 2013 to 2023, sourced from the Refinitiv database. Key variables include inventory turnover, capital intensity, and firm performance metrics such as return on assets (ROA) and return on equity (ROE). Rigorous preprocessing and advanced econometric techniques ensure the reliability and validity of the findings.

While prior studies have established a link between inventory management and firm performance, few have examined how structural characteristics, particularly capital intensity, mediate this relationship, especially in emerging markets like Vietnam. Most existing research overlooks the interaction between inventory practices and asset structure, leading to an incomplete understanding of operational efficiency drivers. In practice, Vietnamese manufacturing firms face persistent challenges in balancing inventory levels and optimizing fixed asset use, issues further amplified during recent

disruptions such as the COVID-19 pandemic. This study addresses this gap by investigating the mediating role of capital intensity, offering both theoretical contributions and practical insights tailored to the context of an emerging economy.

This research contributes to the literature by bridging the gap in understanding the interplay between inventory management, capital intensity, and firm performance, particularly in emerging markets. Additionally, it offers practical implications for policymakers and managers in developing strategies that enhance operational efficiency. The study also responds to the growing need for evidence-based insights tailored to the unique characteristics of Vietnam's manufacturing sector. The paper is structured as follows: *(i)* introduction, *(ii)* literature review, *(iii)* methodology, *(iv)* results & discussion, *(v)* conclusion & recommendations.

2. Literature review

2.1. Background theories

Inventory management is a cornerstone of operational efficiency, significantly influencing firm performance through the lens of the Resource-Based View (RBV) and Transaction Cost Economics (TCE). According to Barney (1991), the RBV posits that firms gain a competitive advantage by effectively managing valuable, rare, inimitable, and non-substitutable resources, such as inventory. Inventory optimization ensures that firms can meet demand while minimizing carrying costs, thereby improving profitability (Davis-Sramek, Mentzer et al. 2008). Complementing this, TCE highlights the importance of reducing transaction costs associated with procurement, holding, and stockouts (Williamson, 1981). Together, these theories underscore the dual role of inventory as a strategic resource and a cost-management tool, forming a foundational argument for exploring its relationship with firm performance.

Expanding this theoretical base, the concept of capital intensity introduces a critical moderating variable in the inventory-performance nexus. Capital intensity, measured by the ratio of fixed assets to total assets, reflects a firm's reliance on physical capital in its operations. The Capital Structure Theory proposed by Modigliani and Miller (1958) suggests that firms with high capital intensity may experience unique cost structures due to significant fixed investments, influencing their working capital and inventory management strategies. Moreover, the Asset Specificity framework within Transaction Cost Economics argues that capital-intensive firms often have highly specialized assets, which can impact their ability to adjust inventory levels quickly (Williamson, 2007). These insights suggest that the interaction between capital intensity and inventory management could either enhance or constrain firm performance, depending on the firm's ability to optimize its resource allocation.

The governance dimension, as explained by Agency Theory and Stakeholder Theory, provides further insights into the mechanisms underlying this relationship. Agency Theory, articulated by Jensen and Meckling (2019), argues that effective governance structures, such as robust monitoring and incentive alignment, can mitigate conflicts of interest between managers and shareholders, ensuring that inventory and capital assets are managed efficiently (Freeman, 2010). In parallel, (Freeman 2010) Stakeholder Theory emphasizes the importance of addressing the needs of diverse stakeholders, including suppliers and creditors, whose interests are directly linked to a firm's inventory and capital intensity decisions. For example, firms with high capital intensity may require more effective supplier collaboration to align production schedules with inventory levels, thereby ensuring stakeholder satisfaction and operational efficiency (Hillman & Keim, 2001).

Adding complexity to this discussion, the Dynamic Capabilities Framework highlights the role of adaptability in managing inventory and capital-intensive assets. Teece et al. (2005) argue that firms with strong dynamic capabilities can reconfigure their resources, including inventory and fixed assets, to adapt to changing market conditions. In capital-intensive industries, such as manufacturing, dynamic capabilities enable firms to optimize inventory levels to respond to shifts in demand, leveraging economies of scale and reducing waste (Eisenhardt & Martin, 2000). This adaptability becomes particularly important in volatile markets, where inventory and capital intensity can either amplify or mitigate risks associated with market uncertainty.

Integrating these perspectives, the Contingency Theory further enhances the argument by emphasizing that the relationship between inventory management and firm performance is context-dependent. According to Donaldson (2001), the optimal strategy for inventory and capital intensity management varies based on factors such as industry characteristics, market volatility, and technological advancements. For instance, in industries with rapid innovation cycles, capital-intensive firms may prioritize lean inventory strategies to minimize obsolescence, while in stable markets, higher inventory levels may complement capital investments to maximize production efficiency. This context-specific understanding provides a nuanced foundation for examining how capital intensity mediates the inventory-performance relationship.

In synthesizing these theories, this study establishes a comprehensive analytical framework that captures both the resource-based and structural dimensions of firm operations. The Resource-Based View and Dynamic Capabilities Framework explain how inventory can serve as a strategic asset, while Transaction Cost Economics and Capital Structure Theory emphasize the cost implications and structural constraints tied to capital intensity. Agency Theory and Stakeholder Theory add governance and relational dimensions, highlighting the roles of internal control and external stakeholder alignment. Finally, Contingency Theory reinforces that the inventory-performance relationship is highly context-dependent, varying across firm size, industry, and institutional environment. Together, these theories provide a multidimensional lens that justifies the proposed model and guides the empirical investigation into how inventory management, mediated by capital intensity, influences firm performance in Vietnam's manufacturing sector.

2.2. Empirical studies

Research on the relationship between inventory management and firm performance has evolved significantly, with studies often differing in focus based on methodologies, contexts, and mediating variables. Numerous studies have examined the direct impact of inventory management on firm performance across industries. For example, Koumanakos (2008) demonstrated that firms maintaining optimal inventory levels experience improved financial performance, particularly in manufacturing. Similarly, Cannon (2008) showed that effective inventory turnover positively correlates with profitability in retail firms. However, these studies often overlook mediating factors, such as capital intensity, that could deepen our understanding of this relationship. This gap highlights an opportunity for further research to incorporate mediating variables like capital intensity to uncover nuanced dynamics.

In the context of mediating variables, several studies have explored factors that bridge inventory management and firm performance. For instance, Rajagopalan and Malhotra (2001)

investigated inventory strategies and identified operational efficiency as a key mediator, while Chen et al. (2005) emphasized the role of market conditions. Although these studies provide valuable insights, they often generalize findings without considering specific structural factors, such as the role of fixed assets, which are captured by capital intensity. Moreover, the methodologies employed, such as linear regression, may oversimplify the complex, nonlinear interactions between inventory, mediators, and performance.

Turning to studies conducted in the Vietnamese market, the literature is comparatively sparse but growing. Studies like Do et al. (2020) analyzed inventory management practices in Vietnamese manufacturing firms and found a significant correlation with profitability. Likewise, Nguyen et al. (2020) highlighted the importance of aligning inventory policies with operational strategies in Vietnamese SMEs. However, these studies typically focus on descriptive analyses and lack a robust theoretical framework, such as integrating mediators like capital intensity. This limitation underscores the need for research that applies advanced modeling techniques to address these gaps in the Vietnamese context.

Comparative studies across regions further illuminate gaps in the literature. For example, Sharma et al. (2022) examined inventory management in Indian manufacturing firms, identifying technology adoption as a critical factor influencing performance. Similarly, Sahari et al. (2012) explored inventory practices in Malaysian firms and underscored the significance of governance mechanisms. However, these studies rarely address capital intensity as a mediator, which is particularly relevant in emerging economies like Vietnam, where fixed asset investments often constitute a substantial portion of total assets. By integrating capital intensity into the analytical framework, future studies could provide a more comprehensive understanding of the inventory's impact on firm performance.

Despite the rich body of empirical work, significant limitations persist. Many studies fail to adopt longitudinal designs, instead relying on cross-sectional data that cannot capture the dynamic relationships between inventory, mediators, and performance (Cannon, 2008, Koumanakos, 2008). Additionally, the over-reliance on traditional econometric methods limits the ability to model nonlinear relationships or account for industry-specific factors. Notably, few studies explicitly investigate the Vietnamese market using robust mediating frameworks like capital intensity. By addressing these limitations through a longitudinal design and advanced econometric modeling, this research seeks to fill critical gaps in the literature, particularly in the underexplored Vietnamese context.

2.3. Hypothesizes developement

Inventory management has long been recognized as a crucial determinant of firm performance, influencing both operational efficiency and profitability. According to the Resource-Based View, inventory is a strategic resource that can provide a competitive advantage when effectively managed (Barney, 1991). Firms that maintain optimal inventory levels can minimize holding costs and reduce the risk of stockouts, leading to improved financial performance (Koumanakos, 2008). For instance, efficient inventory turnover is often associated with reduced working capital requirements, which frees up resources for other productive investments (Chen et al., 2005).

On the other hand, poor inventory management, such as overstocking or understocking, can lead to inefficiencies, higher costs, and lower profitability. Overinvestment in inventory increases holding costs, while

underinvestment risks production disruptions and lost sales opportunities (Cannon, 2008). These dynamics suggest that the relationship between inventory management and firm performance is significant and positive, provided inventory practices are well-managed. Therefore, the following hypothesis is proposed:

Hypothesis 1: Inventory management is positively associated with firm performance.

Capital intensity, measured as the ratio of fixed assets to total assets, reflects a firm's reliance on physical capital to support operations. Theoretical frameworks such as Transaction Cost Economics and Capital Structure Theory emphasize the importance of asset structure in determining operational and financial efficiency (Modigliani & Miller, 1958; Williamson, 1981). Firms with high capital intensity may have greater economies of scale and production capacity, which can influence their inventory practices and, consequently, their performance.

Capital intensity can mediate the inventory-performance relationship in several ways. First, capital-intensive firms often have specialized production systems that require precise inventory management to avoid disruptions and maximize asset utilization (Rajagopalan & Malhotra, 2001). Second, high capital intensity may enable firms to achieve operational efficiencies through technology and automation, which can enhance inventory turnover and reduce holding costs Sharma et al. (2022). Finally, capital intensity reflects long-term investments in productive assets, which can amplify the benefits of efficient inventory practices by ensuring that resources are optimally allocated (Chen et al., 2005).

However, the mediating role of capital intensity may also introduce complexities. For instance, capital-intensive firms may face higher fixed costs, which could limit their flexibility in adjusting inventory levels during demand fluctuations (Sahari et al., 2012). These mixed effects suggest that the mediating role of capital intensity is context-dependent, particularly in industries, such as manufacturing where fixed assets and inventory management are closely intertwined. Given these considerations, the following hypothesis is proposed:

Hypothesis 2: Capital intensity mediates the relationship between inventory management and firm performance.

The development of these hypotheses is rooted in a synthesis of theoretical and empirical evidence. Hypothesis 1 is formed based on the foundational idea that efficient inventory management improves operational efficiency and profitability, supported by theories like the Resource-Based View and empirical studies (Koumanakos, 2008; Chen et al., 2005; Barney, 1991). The positive association is grounded in the assumption that firms with optimal inventory practices can reduce costs and enhance resource allocation.

Hypothesis 2 is developed by integrating insights from theories such as Transaction Cost Economics and Capital Structure Theory, which highlight the role of asset structure in shaping operational outcomes (Williamson 1981; Modigliani & Miller, 1958). Empirical evidence further supports the idea that capital intensity influences the effectiveness of inventory management in enhancing firm performance (Sharma et al., 2022; Rajagopalan & Malhotra, 2001). This hypothesis acknowledges the dual role of capital intensity as both a facilitator and a constraint in the inventory-performance nexus, reflecting its nuanced impact.

3. Methodology

3.1. Data

This research is based on a dataset comprising manufacturing firms listed on Vietnam's three

main stock exchange platforms: the Ho Chi Minh Stock Exchange (HOSE), the Hanoi Stock Exchange (HNX), and the Unlisted Public Company Market (UPCoM). Spanning the period from 2013 to 2023, the dataset provides a comprehensive view of firm-level performance and inventory management practices within Vietnam's manufacturing sector. The data was sourced from the Vietnam Stock website (https://vietstock.vn/), a reputable platform providing comprehensive and reliable financial and operational information on publicly listed firms in Vietnam.

To ensure high-quality data, rigorous preprocessing steps were undertaken. Observations with missing or erroneous values were removed, and extreme outliers were managed using a winsorization technique, which trimmed the top and bottom 1% of values. This approach minimized the distortion caused by anomalies while preserving the integrity of the dataset. After preprocessing, the final sample comprised 4,004 observations, providing a robust and reliable foundation for examining the relationship between inventory management, capital intensity, and firm performance.

The dataset includes essential financial and operational indicators relevant to the research objectives. Key variables encompass inventory turnover ratios, total assets, net sales, and the ratio of fixed assets to total assets, which serves as a proxy for capital intensity. These variables are central to analyzing the mediating role of capital intensity in the inventory-performance nexus.

3.2. Models

The study employs a multiple regression framework to evaluate the relationship between inventory management, capital intensity, and firm performance, while incorporating key control variables to account for additional influencing factors. The general model is specified as follows:

$$Performance_{it} = \beta_0 + \beta_1 Inventory_{it} + \beta_2 Capital\_Intensity_{it} + \beta_3 Invetory^{*}Capital\_Intensity_{it} + \beta_{4\to11} Control_{it} + \varepsilon_{it}$$

In that:

- $Performance_{it}$ is the performance of firm i at time t.
- $Inventory_{it}$ is the inventory factor of firm i at time t.
- $Capital\_Intensity_{it}$ is capital intensity of firm i at time t.
- $Invetory^{*}Capital\_Intensity_{it}$ is the interaction term between inventory and capital intensity of firm i at time t.
- $Control_{it}$ are control variables include: leverage, growth, liquidity, size, covid19.
- $\beta_0 \to \beta_{11}$ are coefficients.
- ε_{it} is the error term.

Appendix 1 *(see Appendix 1 online)* outlines the variables utilized in this study, detailing their measurements and roles within the research framework. The table distinguishes between key factors influencing firm performance and the control variables used to account for additional contextual influences. The Performance metrics, represented by return on assets (ROA) and return on equity (ROE), are pivotal indicators of a firm's efficiency in utilizing its assets and equity to generate profits. These measures provide a comprehensive view of financial performance, making them well-suited for analyzing the inventory-performance relationship.

The variables related to Inventory, including average inventory value (inv) and average inventory days (ind), highlight critical aspects of inventory management. Average inventory days, in particular, is a stand-out metric as it directly captures the efficiency of inventory turnover, a key determinant of operational performance. Capital intensity (ins), measured as the ratio of fixed assets to total assets, is

the central mediating variable of the study. It reflects a firm's reliance on physical capital in its operations and its potential influence on inventory management and firm performance. This variable stands out for its role in bridging the gap between inventory practices and performance outcomes.

Among the control variables, Liquidity (liq) and Leverage (lev) provide insights into a firm's financial health. Liquidity, measured by free cash flow relative to total assets, highlights a firm's capacity to manage short-term obligations, which can directly impact inventory strategies. Leverage, as the ratio of total debt to total assets, contextualizes the influence of capital structure on firm decision-making. Firm size (size), measured using the natural logarithm of total assets, serves as a proxy for the scale of operations, offering additional context for performance variability. Larger firms may benefit from economies of scale in inventory management and fixed asset utilization. Lastly, the inclusion of the COVID-19 period (cov_19) as a dummy variable captures the unique disruptions posed by the pandemic. This variable is significant as it allows the study to account for external shocks that may have influenced inventory management practices and overall performance.

The development of the research model and hypotheses is grounded in both theoretical foundations and prior empirical studies. Specifically, the hypothesized relationships draw from the Resource-Based View and Transaction Cost Economics, which emphasize inventory as a strategic and cost-sensitive resource, as well as Capital Structure Theory, which underscores the role of asset composition in firm performance. Informed by studies such as Koumanakos (2008), Cannon (2008), and Rajagopalan and Malhotra (2001), the model integrates capital intensity as a mediating variable to better capture structural influences. The selection of control variables, including firm size, leverage, liquidity, growth, and the Covid-19 period, is based on their consistent relevance in previous literature and their potential to confound the primary relationships. These variables represent financial health, operational scale, and macroeconomic shocks, which are essential to isolate the true effects of inventory management and capital intensity on firm performance.

4. Results and discussion

4.1. Descriptive analysis

Appendix 2 *(see Appendix 2 online)* provides a descriptive analysis of the variables used in this study, offering insights into their central tendencies, variability, and ranges. For firm performance, the return on assets (ROA) has a mean value of 0.055, indicating that firms generate an average return of 5.5% on their assets. The standard deviation of 0.088 highlights moderate variability, with values ranging from -0.675 to 0.722, reflecting both underperforming and highly profitable firms. Return on equity (ROE) exhibits a higher mean of 0.135 but shows substantial variability, with a standard deviation of 2.344 and a range from -6.794 to 3.562. This wide dispersion suggests the influence of leverage and equity dynamics on firm performance, highlighting cases of extreme losses and gains.

The inventory metrics reveal distinct patterns in inventory management practices. The mean inventory (INV) as a proportion of total assets is 0.245, with a relatively narrow spread (standard deviation of 0.151), suggesting consistency among firms in managing inventory levels. In contrast, average inventory days (IND) display greater variability, with a mean of 99.179 days and a standard deviation of 81.661 days. The range, from 0.021 to 198.374 days, points to significant differences in inventory turnover efficiency, reflecting diverse operational strategies across firms.

Capital intensity (INS), a central focus of this study, has a mean value of 0.624, indicating that

fixed assets constitute a considerable portion of firms' total assets. However, the high standard deviation of 0.457 and the range from 0 to 5.286 demonstrate substantial heterogeneity among firms. Some firms exhibit high capital intensity, heavily relying on fixed assets, while others are less dependent, emphasizing the relevance of examining their mediating role in the relationship between inventory management and firm performance.

The control variables provide additional context for the analysis. The growth (GROW) variable, representing firm growth, has a mean of 0.071 and a standard deviation of 0.408, indicating relatively low average growth with considerable variability across firms. The wide range, from -0.876 to 19.336, suggests the presence of both declining and rapidly expanding firms in the sample. The median value (0.031) also points to a slightly skewed distribution, with a few outliers experiencing unusually high growth. Leverage (LEV), with a mean of 0.491, shows that firms finance nearly half of their assets through debt, with a relatively low standard deviation of 0.224, suggesting consistent leverage levels. Liquidity (LIQ), measured by free cash flow to total assets, has a modest mean of 0.064, but its minimum value of -0.962 highlights the presence of firms facing severe liquidity constraints. Lastly, firm size (SIZE), calculated as the natural logarithm of total assets, has a mean of 27.102 and a standard deviation of 1.577, indicating relatively uniform firm sizes, though the maximum value of 32.866 suggests the presence of a few exceptionally large firms.

Figure 1 presents the correlation coefficients among the variables used in the study, visualized in a heatmap format. This visualization aids in identifying the strength and direction of linear relationships between variables and detecting potential multicollinearity issues that could influence regression results. A key observation is the strong positive correlation between return on assets (ROA) and return on equity (ROE). This finding is expected since both metrics measure firm performance, albeit from different perspectives. Their high correlation underscores their shared ability to represent profitability and validates their use as complementary performance measures.

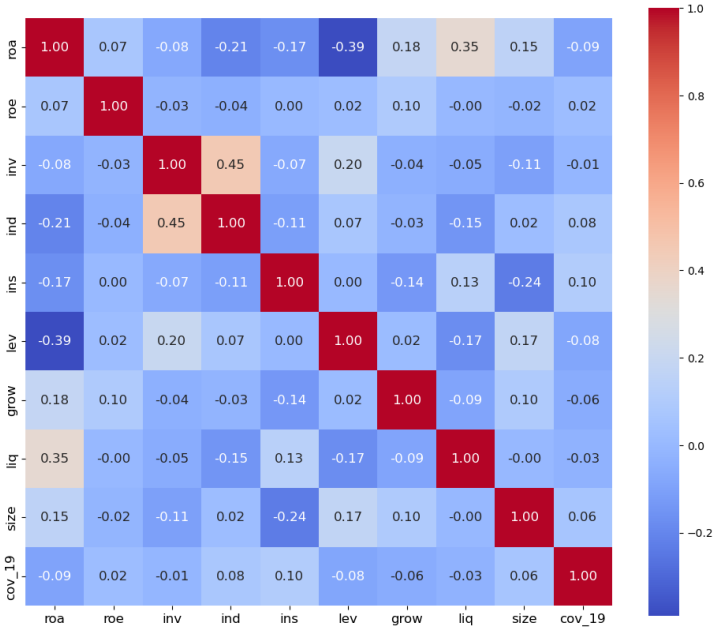

Figure 1. Heatmap of correlation coefficient between variables

In contrast, inventory days (IND) and capital intensity (INS) exhibit a weak correlation, suggesting that inventory turnover efficiency and fixed asset investments are largely independent of each other. This highlights the need to investigate their interaction effects on firm performance, particularly since both are key variables in this study. Interestingly, leverage (LEV) shows a moderate negative correlation with ROA and ROE, indicating that higher debt levels are generally associated with lower profitability. This aligns with the theoretical expectation that excessive leverage may impose financial constraints, adversely affecting firm performance.

The control variable firm size (SIZE) shows a weak positive correlation with both performance metrics (ROA and ROE), suggesting that larger firms might have slightly better profitability. However, this relationship is not strong, indicating that firm size alone does not significantly drive performance in this dataset. Finally, liquidity (LIQ) has a weak negative correlation with leverage (LEV), reflecting the natural trade-off between liquidity and debt levels. Firms with higher liquidity often rely less on external financing, which is consistent with financial theory. The growth (GROW) variable shows weak and mostly insignificant correlations with other variables, suggesting that firm growth is relatively independent from inventory metrics and capital intensity in this sample. Its modest positive correlation with ROA (0.18) and ROE (0.10) implies that higher growth may slightly enhance profitability, but the relationship is not strong.

4.2. Regression results

Table 1 provides the regression results exploring the relationship between inventory management, capital intensity, and firm performance, as measured by return on assets (ROA) and return on equity (ROE). The results highlight key insights that support the study's hypotheses and offer valuable perspectives on the interplay between inventory management and firm performance, as well as the mediating role of capital intensity.

Table 1. Regression results

Dependent	roa	roa	roe	roe
Intercept	0.023***	0.027***	-0.006***	-0.004***
roa_lag1	0.615***	0.606***		
roe_lag1			0.030***	0.024***
ins	-0.031***	-0.040***	-0.003***	-0.004***
inv	0.015**		0.011**	
inv:ins	0.235**		0.121**	
ind		-0.030***		-0.005***
ind:ins		0.410***		0.069***
lev	-0.093***	-0.092***	-0.001*	-0.001
grow	0.242***	0.237***	0.033***	0.031***
liq	0.186***	0.181***	0.019***	0.017***
size	0.023***	0.021***	0.004***	0.004***
cov_19	-0.032***	-0.029***	-0.004***	-0.004***

Note: ****, ** and * indicate significant level at 1%, 5% and 10%.*

The results confirm a significant positive relationship between inventory management and firm performance, as reflected by the coefficients for inventory levels. Firms with well-managed inventory systems tend to exhibit higher profitability, likely due to improved operational efficiency, cost control, and reduced waste. This finding aligns with the Resource-Based View, which suggests that inventory, when strategically managed, can serve as a valuable resource that enhances competitiveness and performance (Barney, 1991). Additionally, the negative relationship between inventory days and firm performance further emphasizes the importance of inventory turnover efficiency, underscoring that prolonged inventory holding periods can erode profitability due to higher carrying costs and potential obsolescence. These insights validate the first hypothesis (H1), highlighting that inventory management plays a crucial role in driving firm performance.

The findings also demonstrate that capital intensity significantly mediates the relationship between inventory management and firm performance. While capital intensity alone negatively affects performance, its interaction with inventory management reveals a positive and significant impact. This suggests that in capital-intensive firms, the benefits of inventory management are amplified, as investments in fixed assets may enhance production capacity and enable firms to leverage economies of scale. For instance, capital-intensive firms often rely on advanced systems and automation, which can streamline inventory processes, reduce costs, and improve coordination between inventory levels and operational demands (Rajagopalan & Malhotra, 2001). These dynamics support the second hypothesis (H2), confirming that capital intensity acts as a mediator that strengthens the positive effects of inventory practices on firm performance. This mediating effect also highlights an important nuance: while capital intensity can impose fixed costs and financial constraints, it simultaneously provides the infrastructure needed for efficient inventory utilization. This dual role underscores the need for firms to carefully balance their capital investments and inventory strategies to maximize their performance outcomes.

The control variables further enrich the discussion by providing additional context for firm performance. Liquidity, for example, has a significant positive impact, suggesting that firms with higher liquidity are better positioned to manage inventory and capital expenditures, thereby achieving superior profitability. Similarly, firm size consistently shows a positive effect, reflecting the advantage of economies of scale in managing inventory and fixed assets. Larger firms may also benefit from more robust systems and better access to resources, enabling them to optimize their operations. On the other hand, leverage negatively affects performance, indicating that higher debt levels constrain profitability by imposing financial obligations that limit operational flexibility. The adverse impact of the COVID-19 period highlights the vulnerability of firms to external shocks, emphasizing the importance of adaptive inventory and capital strategies during times of crisis.

These findings not only confirm the theoretical expectations but also reflect important structural realities in the Vietnamese manufacturing sector. The negative standalone effect of capital intensity on firm performance suggests that excessive investment in fixed assets may reduce financial flexibility or result in underutilized capacity if not supported by efficient inventory practices. However, the significant and positive interaction effects indicate that when inventory management is aligned with capital structure, firms can better leverage their fixed assets to drive operational efficiency. This highlights the importance of integrative resource strategies rather than

isolated optimization efforts. Furthermore, the significant role of control variables, such as liquidity and leverage, emphasizes that internal financial conditions are crucial enablers of the effectiveness of inventory and capital utilization. These insights suggest that firm performance is not merely a function of individual operational levers but rather the result of strategic alignment across multiple resource dimensions.

5. Conclusion and recommendation

5.1. Conclusion

This study investigates the relationship between inventory management and firm performance, focusing on the mediating role of capital intensity. The results reveal that inventory management significantly enhances firm performance, as efficient inventory practices improve operational efficiency, reduce costs, and increase profitability. The positive impact of inventory management is further emphasized by the finding that firms with shorter inventory holding periods perform better, underscoring the importance of inventory turnover efficiency. Capital intensity is shown to play a dual role; while it negatively affects performance when considered alone, its interaction with inventory management amplifies the positive impact of inventory practices. Control variables, such as liquidity, firm size, and leverage, also contribute to explaining variations in firm performance, highlighting their relevance in the broader framework.

From a theoretical perspective, these findings align with and expand upon the Resource-Based View and Transaction Cost Economics. According to the Resource-Based View, inventory serves as a valuable resource that, when managed effectively, enhances firm performance (Barney, 1991). This study confirms this premise by demonstrating the direct positive relationship between inventory management and firm profitability. The results also align with Transaction Cost Economics, which emphasizes the importance of minimizing holding and transaction costs associated with inventory management (Williamson, 2007). Additionally, the findings validate the role of capital intensity as an influencing factor, consistent with prior studies suggesting that asset structure impacts operational efficiency and profitability (Chen et al., 2005; Rajagopalan & Malhotra, 2001).

The results of this research are consistent with previous empirical studies on inventory management and firm performance. For instance, Koumanakos (2008) and Cannon (2008) highlighted the positive impact of efficient inventory management on profitability. However, this study advances the literature by integrating the mediating role of capital intensity, a factor that has been relatively underexplored. Unlike earlier studies that focused solely on inventory metrics, this research demonstrates how capital intensity interacts with inventory practices to shape firm performance, particularly in a manufacturing context. Moreover, the findings from the Vietnamese manufacturing sector provide novel evidence from an emerging market, filling a geographical gap in the existing literature.

This research makes several important contributions. *First*, it extends the theoretical understanding of the inventory-performance relationship by introducing capital intensity as a mediating factor. By doing so, it integrates insights from Resource-Based View, Transaction Cost Economics, and Capital Structure Theory to offer a multidimensional perspective on inventory management. *Second*, the study provides empirical evidence from Vietnam, contributing to the limited body of research on inventory practices in emerging markets. This context-specific analysis adds to the global literature by highlighting the unique dynamics of inventory management and capital

investments in a rapidly developing economy. *Finally*, the findings enrich the managerial literature by demonstrating the interplay between inventory management, capital intensity, and firm performance, providing a foundation for further research into strategic resource allocation and operational efficiency.

In summary, this study underscores the critical role of inventory management in driving firm performance and highlights the importance of considering capital intensity as a mediating factor. By building on established theories and expanding empirical evidence, it contributes to both academic understanding and the practical management of resources in the manufacturing sector. These findings not only confirm but also extend the existing literature, offering new insights into the complexities of inventory and performance dynamics.

5.2. Recommendation

Based on the findings of this study, several specific recommendations can be made for manufacturing firms, particularly in the Vietnamese context, to optimize their inventory management practices and leverage capital intensity to enhance firm performance.

First, firms should focus on improving inventory turnover efficiency by reducing the average number of days inventory is held. This can be achieved through the adoption of advanced inventory management systems, such as just-in-time (JIT) or demand-driven replenishment models, which minimize holding costs while ensuring sufficient inventory levels to meet demand. Additionally, firms should utilize forecasting tools and analytics to predict demand patterns accurately, reducing the risk of overstocking or understocking. This approach not only optimizes operational efficiency but also aligns inventory levels with production schedules and market needs.

Second, firms with high capital intensity must align their inventory strategies with their fixed asset structures. For instance, capital-intensive firms can invest in automation technologies, such as robotic process automation (RPA) and warehouse management systems (WMS), to streamline inventory processes and enhance coordination between fixed assets and inventory levels. These technologies can help optimize the utilization of machinery and infrastructure, reducing downtime and ensuring seamless production workflows. Furthermore, firms should integrate their inventory systems with production planning software to achieve better synchronization between inventory levels and operational demands.

Third, liquidity management should be prioritized to complement inventory and capital strategies. Firms with higher liquidity levels are better positioned to invest in advanced technologies and implement efficient inventory practices. Therefore, firms should maintain adequate free cash flow by managing receivables and payables effectively and avoiding excessive reliance on external debt. Additionally, firms should explore alternative financing options, such as trade credit or supply chain financing, to support their inventory operations without overburdening their capital structure.

Fourth, firms should pay attention to the potential risks posed by high leverage, as it negatively impacts performance. Managers should aim to balance their debt levels by considering their operational cash flows and long-term investment strategies. In particular, firms should evaluate their borrowing decisions in the context of their capital intensity and inventory needs, ensuring that debt financing is aligned with their operational goals and financial capacity.

Lastly, firms must prepare for external shocks, such as the COVID-19 pandemic, by building more resilient inventory and operational strategies. Diversifying suppliers, maintaining strategic safety stock levels, and

incorporating flexible production systems can help mitigate the impact of disruptions. Firms should also invest in digital transformation initiatives to enhance supply chain visibility and responsiveness, enabling them to adapt to unexpected changes in demand or supply conditions.

In conclusion, manufacturing firms can significantly enhance their performance by adopting a holistic approach to inventory and capital management. By leveraging technology, optimizing liquidity, and maintaining a balance between leverage and operational efficiency, firms can create a robust framework that supports sustained growth and competitiveness in dynamic market environments. These recommendations are particularly relevant for firms operating in emerging markets like Vietnam, where resource constraints and market volatility demand innovative and adaptable management strategies.

5.3. Limitations and further research

Despite its contributions, this study has several limitations that warrant consideration. *First*, the dataset is limited to manufacturing firms listed on Vietnam's three major stock exchanges, potentially excluding insights from smaller, unlisted firms or firms in other industries where inventory management and capital intensity may exhibit different dynamics. *Second*, the study focuses on a specific timeframe (2013–2023), which may not fully capture long-term trends or the evolving nature of inventory management practices, particularly in response to technological advancements or market shifts. *Third*, the reliance on secondary data from the Refinitiv database, while comprehensive, restricts the study to observable variables, potentially omitting qualitative factors such as management expertise or organizational culture that may also influence the inventory-performance relationship. *Lastly*, the study employs a multiple regression framework, which, while robust, may not fully account for complex, non-linear relationships or causal mechanisms.

Future research could address these limitations by expanding the scope to include a broader range of industries and firm sizes, offering a more comprehensive understanding of the inventory-performance relationship across different contexts. Longitudinal studies that span multiple economic cycles could also provide deeper insights into the dynamic interplay between inventory management, capital intensity, and firm performance over time. Additionally, incorporating qualitative approaches, such as interviews or case studies, could enrich the analysis by capturing organizational and managerial factors that influence inventory practices. Methodologically, future research could explore advanced techniques, such as structural equation modeling (SEM) or machine learning algorithms, to examine non-linear relationships and identify potential causal pathways. Furthermore, comparative studies across emerging and developed markets could shed light on the contextual factors shaping inventory management and capital intensity dynamics, enhancing the generalizability of findings.

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