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Net Working Capital and Firm Performance: The Moderating Role of Firm Size in Emerging Markets

Thuy Thi Cam Nguyen [1*]

[1] *Faculty of Accounting and Auditing, Academy of Finance – Hung Yen Campus, Hung Yen, Viet Nam.*

Abstract

This study examines the relationship between net working capital and business performance and analyzes the moderating role of firm size in this relationship in emerging markets. Drawing on trade-off theory, the resource-based perspective, and agency theory, the study suggests that the impact of net working capital on performance varies with firm size. Using panel data on 370 non-financial publicly traded companies in Vietnam from 2013 to 2024, the study employs an interaction regression model with firm size as the moderating variable. The analysis proceeds in multiple steps, including OLS, fixed-effects, random-effects, and FGLS models, and, in particular, a GMM-robust model to address endogeneity, heteroskedasticity, and autocorrelation. Empirical results show that net working capital significantly affects business performance, as measured by ROA and ROE. Firm size not only directly affects operational efficiency but also moderates the relationship between net working capital and operational efficiency. Specifically, the impact of net working capital differs significantly across firm sizes, reflecting differences in resource access and management efficiency. This research contributes to the existing literature by clarifying the moderating mechanism of firm size in working capital management and by providing new empirical evidence from emerging markets, offering important implications for managers and policymakers.

Keywords:
Financial Performance;
Moderating Role;
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Working Capital Management;
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1- Introduction

Working capital management (WCM) has long been recognized as a vital part of short-term financial management because it directly influences a business's liquidity, operational risk, and profitability [1]. An effective WCM strategy improves financial performance and reduces risks, making it one of the most important decisions for companies across all industries and sizes [2, 3]. Among WCM tools, Net Working Capital (NWC) (calculated as the difference between current assets and current liabilities) shows the amount of capital needed for smooth operations. It also reflects the structure of short-term financing and the company's level of investment in current assets. Unlike measures based on time, such as the Cash Conversion Cycle (CCC), NWC indicates the actual capital available at a specific moment for daily operations, making it a key indicator in assessing how well current assets, cash flow, and financing policies are managed [4-7]. The importance of WCM has been supported by many empirical studies. Wanzala & Obokoh [8] suggest that working capital management significantly impacts profitability, liquidity, and investment decisions. Likewise, Deloof [9] provides evidence that careful management of receivables, inventories, and payables leads to higher profits. This underscores the core idea: investing more than needed in working capital can increase opportunity costs, while investing too little can cause liquidity problems, operational issues, and decreased efficiency.

Over the past 20 years, the relationship between WCM, NWC, and company performance has gained increasing attention. Classic studies, such as Shin & Soenen [10] and Deloof [9], found that reducing the cash collection cycle or improving inventory management enhances operational efficiency (ROA/ROE). However, recent evidence suggests that

* **CONTACT**: thuy.ntc@ufba.edu.vn

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this relationship is no longer strictly linear. Many studies identify a nonlinear − often inverted U-shaped − relationship, with an optimal NWC level that maximizes efficiency. Beyond this point, efficiency declines because capital is tied up in current assets [11]. Recent literature reviews have also highlighted the inconsistency in conclusions about the impact of WCM on firm performance, due to differences in measures (stock NWC or CCC in days), sample characteristics, country contexts, and covariates such as financial constraints, governance, or funding structure [12-14].

Although the existing literature research has examined working capital across various contexts, significant research gaps remain. First, most studies focus on flow metrics (such as CCC), while evidence on NWC as a stock variable (NWC or NWC on total assets) remains limited. Second, the impact of NWC on efficiency across many dimensions, including accounting efficiency (ROA, ROE) and market value (Tobin's Q), has not been comprehensively examined. Third, the moderating role of firm size (SIZE) (through the NWC × SIZE interaction) remains a relatively new and underexplored topic in corporate finance. Existing evidence is fragmented: some studies report a positive impact of NWC on operational safety [9, 15], while others show a negative impact or dependence on financial constraints and growth rates [5, 16]. Differences between developed and developing economies, as well as macroeconomic conditions, and short-term asset structures further complicate this relationship [17].

In Vietnam, empirical evidence on WCM and financial performance remains limited, and focuses mainly on CCC rather than NWC [18]. Some recent studies, such as Pham et al. [19] and Quy & Nguyen [20], report positive initial results but are limited by small sample sizes, a lack of control for macroeconomic factors, and a failure to consider interaction relationships or regulatory mechanisms. To date, no study in Vietnam has analyzed NWC as a stock variable, examined the NWC × SIZE interaction, or simultaneously assessed the impact on both accounting performance and market value using large-scale panel data. This gap underscores the urgent need to expand research in an emerging market where credit conditions, the cost of capital, and financing structures differ significantly from those in developed economies.

From a theoretical perspective, firm size can play a crucial role in shaping the relationship between net working capital (NWC) and operational efficiency. According to the Trade-off Theory, firms must balance the benefits of maintaining liquidity with the costs of holding current assets; larger firms, with better access to capital and lower financing costs, can tolerate higher NWC levels without compromising efficiency. Conversely, for smaller firms, excess working capital can significantly pressure profitability. From a Resource-based perspective, size reflects the ability to access and utilize strategic resources, thereby influencing the effectiveness of short-term financial decisions. Furthermore, Agency Theory suggests that larger firms generally have more developed oversight mechanisms and governance systems, which help limit the inefficient use of working capital relative to smaller firms.

Given these gaps, this study aims to analyze the impact of net working capital on business performance and clarify the moderating role of firm size in this relationship in emerging markets. Performance is measured using three common indicators: return on assets (ROA), return on equity (ROE), and Tobin's Q (TobinQ), reflecting both asset utilization efficiency and shareholder value creation efficiency. The study uses panel data from businesses over a long-term period, combined with an interaction model between net working capital and firm size, thereby allowing direct testing of the moderating role of size.

Based on that, the study focuses on answering the following questions:

- How does net working capital (NWC) affect the financial performance (ROA, ROE, Tobin's Q) of companies in Vietnam?
- Does the impact of NWC differ between accounting performance and market value?
- Does firm size (SIZE) moderate the relationship between NWC and financial performance, and what is the nature of this moderation?
- How do internal and macroeconomic control factors affect the extent and direction of the impact of NWC in the model?

This study contributes to the existing literature in three main ways. First, it expands the theoretical framework for working capital management by clarifying the moderating role of firm size, rather than treating size as a control variable. Second, the study provides new empirical evidence from emerging markets, where financial and institutional conditions can significantly alter the mechanism by which working capital affects operational efficiency. Third, the empirical results obtained using the GMM-Robust methodology offer important managerial implications, helping businesses adjust their working capital policies to suit their scale in order to optimize operational efficiency and enterprise value.

Our paper is organized into five sections. Following the introduction, there is an overview of the research and the development of the hypothesis. Next is the research methodology, which clarifies the data, the model, the estimated variables, the estimation strategy, and the approach to endogeneity. Section 4 presents the results and discussion. Finally, the paper concludes with implications for management, policy, and investors, as well as limitations and directions for future research.

2- Literature Review and Hypothesis Development

2-1- Foundational Theory

Working capital management (specifically Net Working Capital (NWC)) is essential to a business's short-term financial operations because it indicates the net short-term capital required to sustain ongoing operations (cash, receivables, inventories, etc.). Therefore, NWC is a "stock" indicator − showing a specific moment in time − rather than a "flow" indicator like revenue, cash flow, or the cash conversion cycle (CCC). The higher the NWC level, the higher the liquidity of the company, and thus the more sustainable its financial security [21, 22].

From the corporate finance theoretical framework, the relationship between NWC and business performance is explained through two main perspectives:

(i) *Trade-off Theory*

The Trade-off Theory was initially developed to explain the optimal capital structure and later expanded to short-term financial decisions, including working capital management [23]. According to this theory, businesses must balance the benefits of maintaining high working capital (ensuring liquidity and reducing the risk of operational disruption) with the costs of holding excessive working capital (opportunity cost of capital and the loss of the benefit of higher-yielding investments). From this perspective, the Trade-off Theory argues that maintaining working capital at too low a level increases liquidity risk and reduces operational efficiency. Conversely, maintaining working capital at an excessively high level ties up more capital in current assets, thereby increasing opportunity costs and reducing operational efficiency. Therefore, the impact of NWC on operational efficiency is not always positive and can be optimized at an equilibrium point [14, 24]. Aktas et al. [7] assert that operating efficiency improves as companies approach the optimal level of net working capital. As external financing becomes more accessible, large companies may not need to maintain high net working capital (NWC) as a buffer, thereby mitigating the positive impact of NWC on operating efficiency; they can optimize NWC without holding excess working capital [14, 25].

(ii) *Pecking Order Theory*

The Pecking-order Theory, introduced by Almeida & Campello [26], explains firms' financing behavior by prioritizing internal capital, then debt, and finally equity to avoid asymmetric information costs. This theory emphasizes that internal capital is cheaper and less likely to mislead investors than external financing. Fazzari & Petersen [27] describe NWC as a financial cushion under credit constraints. In the context of working capital management, this theory implies that firms prioritize internal cash flow to finance current assets rather than seeking external debt. When internal cash flow is limited, firms may reduce working capital, thereby increasing liquidity risk and affecting operations. This explains why the relationship between NWC and operational efficiency varies with the degree of financial constraint the firm faces.

Additionally, according to the Pecking-order Theory, smaller firms face higher information costs and credit barriers, making them more reliant on internal capital (NWC) to finance operations. Consequently, NWC's effect on efficiency is more noticeable in small firms. Many studies on SMEs and small firms support the idea that the effects of working capital differ by firm size [28, 29].

Therefore, the theoretical link between NWC and firm performance is likely nonlinear (possibly with an optimal point), and firm size (SIZE) can influence this relationship due to differences in capital costs, financing options, and financial constraints.

(iii) *Agency Theory*

Agency Theory focuses on conflicts of interest between owners and management, particularly in the context of asymmetric information and asset control [30]. When the parties have differing objectives, agency costs arise and influence financial decisions, including working capital management. Management may over-hoard working capital to increase business size without achieving real operational efficiency. Larger businesses may have better control systems, reducing agency costs. Thus, the impact of holding excess working capital on efficiency may differ from that of smaller businesses.

Agency Theory is therefore used to explain why firm size (along with supervisory/reward mechanisms) can regulate the relationship between NWC and operational efficiency.

In addition to Agency Theory, this study integrates Trade-off Theory and Pecking Order Theory to explain the relationship between net working capital and firm performance. Although these two theories offer different predictions, they are not mutually exclusive and can govern under different conditions. Specifically, the Trade-off Theory is expected to play a dominant role when working capital holding costs are high, while the considerations of the Pecking Order Theory become more important when a firm faces financial constraints.

2-2- WCM Measurement Methods

In studying working capital management, WCM is typically measured in two primary ways:

(i) Flow-based or time-based measures: This approach is based on the cash flow cycle or working capital turnover, often measured by the Cash Conversion Cycle (CCC) or its components: days receivable (Days Sales Outstanding – DSO), days inventory (Days Inventory Outstanding – DIO), and days payable (Days Payable Outstanding – DPO). The time-based measure (CCC) tracks the dynamics of collection, inventory, and payment processes and is frequently used to assess operational efficiency, as seen in studies by [9, 31, 17].

(ii) Stock-based measures: This method evaluates the amount of net working capital a company holds at a specific point, usually measured by Net Working Capital (NWC) or the ratio of net working capital to total assets (NWC/TA). NWC is calculated as the difference between current assets and current liabilities (NWC = Current Assets − Current Liabilities). This measure indicates the level of investment in working capital. It is preferred in research on financial risk, liquidity, and performance because it tends to be more stable and compatible with panel data models [7, 32, 33].

The distinction between these two measures is more than just technical: they capture different economic aspects − CCC is sensitive to cash flow cycles and trade credit policies, while NWC emphasizes the level of net investment in current assets and the opportunity cost of capital. Moreover, the variety of measurement methods can lead to different findings − from a negative relationship between WCM and profitability, to a nonlinear pattern (concave or inverted U-shape), or no clear link at all, depending on the country, industry, and timeframe involved.

2-3- Relationship Between WCM and Financial Performance

2-3-1- Studies Measuring WCM Using Flow-Based or Time-Based Measures

One of the early foundational studies was conducted by Deloof [9]. He used a sample of 1,009 Belgian non-financial companies from 1992 to 1996 and measured WCM through the CCC and its components − Days Receivable, Inventory, and Payables. Deloof [9] showed that reducing the collection period for receivables and inventory, meaning effective WCM, is negatively related to the working capital holding period and positively related to profitability. Since then, many empirical studies across Europe, Asia, and America, in both developed and emerging economies, have examined this relationship [17, 31, 34]. Kiymaz et al. [17] found that CCC is inversely related to firm performance in both developed and emerging economies, though differences exist among the components of CCC. They also noted that longer inventory days are associated with higher performance in developed economies compared to emerging economies. At the same time, they highlighted that country-specific factors, such as gross domestic product (GDP), interest rates, and inflation, impact firm WCM differently.

2-3-2- Studies Measuring WCM by Level-Based Measures

Baños-Caballero et al. [14] and Anton and Afloarei Nucu [34] find that the relationship between working capital and firm performance is concave − meaning there is an "optimal" level of WCM. This suggests that investing in WCM increases firm value up to a certain point, after which performance declines. The optimal point depends on the firm's financial condition and credit constraints. Mahmood et al. [32] observes that the negative (positive) relationship between state (foreign) ownership and NWC is stronger in less financially constrained firms, especially in countries with strong governance institutions, particularly at low NWC levels.

Recent studies have expanded the market-value perspective beyond accounting profits, showing that effective WCM not only improves ROA/ROE but also correlates with higher market value. This is especially true in emerging economies where the cost of capital and liquidity risks are high [35]. Huynh et al. [36] argues that improving working capital efficiency by reducing working capital investment increases firm value, and that the firm's financial constraints influence this relationship. On the contrary, Baños-Caballero et al. [11] emphasize that increasing NWC raises firm value. Their research also shows that NWC varies across countries and depends on factors such as investor protection and a country's financial and economic development. In other words, findings from developed markets cannot be directly applied to emerging markets. Therefore, research on Vietnamese or ASEAN samples is needed to identify the appropriate NWC level in the local context. Overall, the international literature largely agrees that WCM, if properly managed, can enhance profitability and firm value, supporting the idea of an "optimal working capital".

In Vietnam, some recent research has explored the link between WCM and firm performance, mainly using CCC or flow-based indicators. Phuong and Hung [18] find a negative relationship between CCC and ROA / Tobin's Q, indicating that longer working capital cycles (poorer WCM) reduce profitability and market value. Another study by Huynh et al. [36] shows that well-managed WCM positively impacts profitability, whereas lax WCM can be detrimental.

Several sector-specific studies (e.g., manufacturing, consumer, utilities, steel) also demonstrate a relationship between working capital management and financial performance, though results can vary depending on sector, inventory/ credit/business cycle strategies, and firm size [18, 19, 37, 38].

In summary, despite limited evidence, findings from Vietnam indicate that WCM is important. However, standard WCM variables like NWC (stock-based) are rarely used, and few studies analyze accounting efficiency, market value, and regulatory factors together.

2-4- Research Gaps

The review of international and domestic studies shows that significant gaps still exist in the field of working capital management, especially in emerging markets like Vietnam. These gaps underline the importance and relevance of this study.

First, there is a clear lack of research examining the impact of net working capital (NWC) or NWC normalized by total assets (NWC/TA) on financial performance in emerging economies. Most studies in Vietnam mainly use the CCC as an indicator of working capital management. However, while CCC reflects the speed of receipts and disbursements and the ability to turn over capital, it does not measure the level of investment in working capital or the amount of capital "locked up" in current assets. Conversely, NWC directly indicates the "level of working capital commitment," reflecting a firm's investment structure and capital allocation decisions. Although recent international research (e.g., [7, 28] recommends shifting focus from flow-based metrics such as CCC to level-based measures like NWC, empirical evidence from developing countries remains limited. Therefore, research involving NWC helps fill this critical gap.

Second, the moderating effect of firm size on the relationship between NWC and financial performance has not been thoroughly examined, especially in emerging markets. Some international studies − for instance, [33] − suggest that large and small firms may respond differently to working capital investment decisions due to differences in management capabilities, financial constraints, and bargaining power. However, little research in Vietnam has assessed whether firm size influences the direction and strength of the NWC → financial performance relationship. This is especially relevant given the diversity of Vietnamese firms in terms of access to credit, management professionalism, and market competitiveness. This study addresses this gap by directly testing the NWC × Size interaction and providing insights into the different effect mechanisms across various firm groups.

Third, most empirical evidence in Vietnam relies on traditional estimation methods like OLS, FEM, or REM, which do not fully account for the endogeneity issues inherent in the relationship between WCM and financial performance. Working capital decisions both influence and are influenced by operating performance, leading to challenges such as reverse causality, omitted-variable bias, or changing error correlations over time. Internationally, there has been a notable shift toward using SGMM or two-step GMM systems to address endogeneity and incorporate lagged dependent variables [39, 40]. However, Vietnamese research has rarely employed these advanced techniques consistently. Therefore, employing SGMM/IV-GMM in this study will enhance the robustness and validity of the findings.

Fourth, research on NWC in Asian emerging markets is relatively limited, especially for large-sample, long-term, multi-industry studies. Many ASEAN studies are confined to a few industries or shorter periods, limiting their generalizability. Moreover, the number of studies explicitly linking working capital behavior to foundational theories − such as Trade-off Theory or Pecking Order Theory − is limited. Vietnam's context, characterized by high capital costs, significant information asymmetry, and notable differences between small and large firms, offers an environment to generate new insights that complement international discussions. This research, with a large sample size, long-term data, and a solid theoretical framework, aims to bridge this gap.

Overall, these four gaps highlight the critical need to explore the relationship among NWC, financial performance, and the moderating role of size in Vietnam. They also emphasize the novelty, importance, and scientific contribution of this research.

2-5- Hypotheses Development

According to the Trade-off Theory, firms balance the benefits of liquidity against the opportunity costs of holding current assets [41]. High levels of net working capital (NWC) can help firms avoid production disruptions, reduce liquidity risk, and capture market opportunities. However, maintaining high levels of current assets ties up substantial capital in low-return assets, lowering overall profitability [7]. Evidence shows that this negative effect is stronger in emerging economies, where firms often face capital constraints and hold lower levels of current assets than those in developed markets [42, 43].

Based on the theoretical framework and global evidence, this study hypothesizes that an increase in NWC, indicating a greater working capital commitment, will decrease firms' financial performance in Vietnam. This forms the basis for the first hypothesis:

H_1: The level of working capital investment (NWC) has a negative effect on firms' financial performance.

Beyond the direct effects of working capital management (WCM), recent studies highlight that the impact of working capital is heavily influenced by firm characteristics, with enterprise size (SIZE) serving as a key moderating factor [33]. Larger firms generally have more financial resources, stronger bargaining power, professional management practices, and higher risk tolerance [44]. These advantages allow them to maintain higher NWC levels without incurring significant opportunity costs. Conversely, smaller firms often face credit limitations, higher capital costs, and lower asset turnover, which exacerbate the adverse effects of investing in current assets [29].

Most research on emerging markets has not systematically examined the moderating role of firm size, particularly when using level-based rather than time-based measures. Therefore, analyzing the interaction between NWC and SIZE in this study clarifies how WCM operates and provides new insights into corporate financial management in Vietnam. Based on this, the study proposes the second hypothesis:

H_2: Firm size influences the relationship between NWC and financial performance, with the negative impact of NWC decreasing as firm size increases.

Although some previous studies have suggested a nonlinear relationship or an optimal working capital level, this study focuses on a conditional linear relationship to ensure the model's simplicity and interpretability in the context of dynamic panel data in emerging markets.

3- Research Methodology

3-1- Research Data

This study utilizes a panel dataset of 370 non-financial companies listed on the Vietnamese stock market from 2013 to 2024. Companies in the financial sector (banking, insurance) and observations with missing data or signs of significant deviation were excluded to ensure consistency and reliability. Original data were collected manually from audited financial statements, annual reports available on each company's website, and the websites of Vietnamese stock exchanges [44, 45]. Macroeconomic data related to GDP and INF were obtained from the World Bank website [46]. After filtering and cross-checking, the data were compiled into a robust balanced panel comprising a total of 4,440 observations (370 companies × 12 years). Observations with missing data were processed and removed following a standard procedure to maintain data integrity.

The data cleaning process included: (i) removing observations with missing values in key variables; (ii) verifying figure consistency by comparing reporting items (e.g., assets versus liabilities); (iii) identifying and removing suspected outliers through manual review and cross-referencing across sources; and (iv) normalizing the NWC and SIZE variables using average firm values to support interaction analysis and reduce multicollinearity between the main and interaction variables.

Using a balanced panel dataset helps ensure consistent estimation; however, it may reduce the generalizability of the results by excluding newly listed or delisted companies during the study period.

3-2- Research Model

To assess the impact of net working capital (NWC) on financial performance and examine the moderating role of firm size (SIZE), the study presents the following regression model:

$$PERF_{it} = \beta_0 + \beta_1 NWCc_{it} + \beta_2 SIZEc_{it} + \beta_3 NWC\_SIZE_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where, $PERF_{it}$ represents the ROA and ROE of company i in year t; μ_i is the fixed effects, controlling for firm-invariant factors such as management characteristics or industry differences; λ_t captures the effect of macroeconomic shocks over time, like policy changes; ε_{it} is the random error; and the coefficient β_1 indicates the marginal effect of NWCc on financial performance when SIZEc is at its average level before centralization, while β_3 shows the moderating effect of size.

Including firm- and year-specific effects is essential to distinguish the static impact of unobserved characteristics from those that vary over time, helping to reduce bias from unobserved constant factors.

3-3- Measurement of Variables

The variables in the research model are measured as follows:

Dependent Variable (Financial Efficiency)

- ROA (Return on Assets): profit after tax divided by total assets; indicates the efficiency of asset utilization.
- ROE (Return on Equity): profit after tax divided by equity; shows the efficiency of equity utilization.

Main Explanatory Variable

NWC (Net Working Capital): NWC is calculated as current assets minus current liabilities. To facilitate analysis and limit multicollinearity when creating interaction variables, NWC is centered on its mean (mean-centering) to produce NWCc. Furthermore, using net working capital as a normalized value limits the impact of size differences between firms. This approach enhances comparability in dynamic panel models, although alternative measures, such as NWC as a percentage of total assets, have also been commonly used in prior studies.

Moderating Variable

SIZE: Firm size is measured by the logarithm of total assets, consistent with previous studies. To match NWCc in the interaction term, SIZE is centered to SIZEc. The interaction variable is defined as NWC_SIZE = NWCc × SIZEc, to examine whether firm size moderates the impact of working capital on financial performance. Alternative measures, such as revenue or market capitalization, may capture additional aspects of firm size and warrant further investigation.

Control Variables

The control variables include factors with a theoretical basis for influencing financial performance: cash and cash equivalents to total assets ratio (CASHD), cash flow from operations to total assets (CFOTA), financial leverage (LEV = Liabilities/Total Assets), liquidity (LIQ = Current Assets/Current Liabilities), and macroeconomic variables such as GDP growth (GDP) and inflation (INF).

Standardization and Interaction Processing

Centering NWC and SIZE before forming the interaction term reduces the linear correlation between the main components and the interaction variable, ensuring the interaction coefficient remains interpretable: β3 indicates how much the slope of NWC changes as SIZE increases by 1 unit (after centering).

3-4- Estimation Strategy and Endogeneity Treatment

The relationship between net working capital (NWC) and financial performance is likely to be influenced by endogeneity for two main reasons. First, there is a bidirectional causal relationship: more efficient firms may proactively adjust their working capital policies by shortening collection periods, optimizing inventory, or renegotiating payment terms, which can partly determine NWC. Second, unobservable or difficult-to-measure factors – such as management capacity, risk management quality, or industry specifics – can simultaneously affect both NWC and performance, causing omitted-variable bias if not properly controlled.

To address these econometric issues and ensure the reliability of the results, the study employs a stepwise estimation strategy. Initially, the model was estimated using OLS with cluster-adjusted standard errors to provide a preliminary descriptive view of the coefficients' signs and magnitudes. Next, a Fixed Effects Model (FEM) was used to control for time-invariant firm characteristics, and a Random Effects Model (REM) was estimated for comparison. The Hausman test was applied to select the appropriate model between FEM and REM.

Subsequently, to address both heterogeneity and autocorrelation in panel data, the study employed the Feasible Generalized Least Squares (FGLS) method as a sensitivity analysis. However, since FGLS does not fully address endogeneity, a two-step System Generalized Method of Moments (System-GMM) was applied as the primary estimation method. System-GMM is particularly well suited to panel data with a large number of firms and relatively short observation periods, allowing for endogenous controls, lagged dependent variables, and unobservable fixed effects.

To ensure the reliability of the GMM estimates, the study uses the Windmeijer correction for standard errors, the Hansen J-test to assess the validity of the tool set, and AR(1) and AR(2) tests to check for error autocorrelation. At the same time, to avoid tool explosion, the number of tools is limited by selecting appropriate lags and applying tool-reduction techniques. Diagnostic tests show that the tool set used is appropriate and that the model assumptions are satisfied.

To mitigate instrument proliferation, the number of instruments is carefully restricted using appropriate lag limits and instrument collapsing. Instrument validity is supported by standard diagnostic tests.

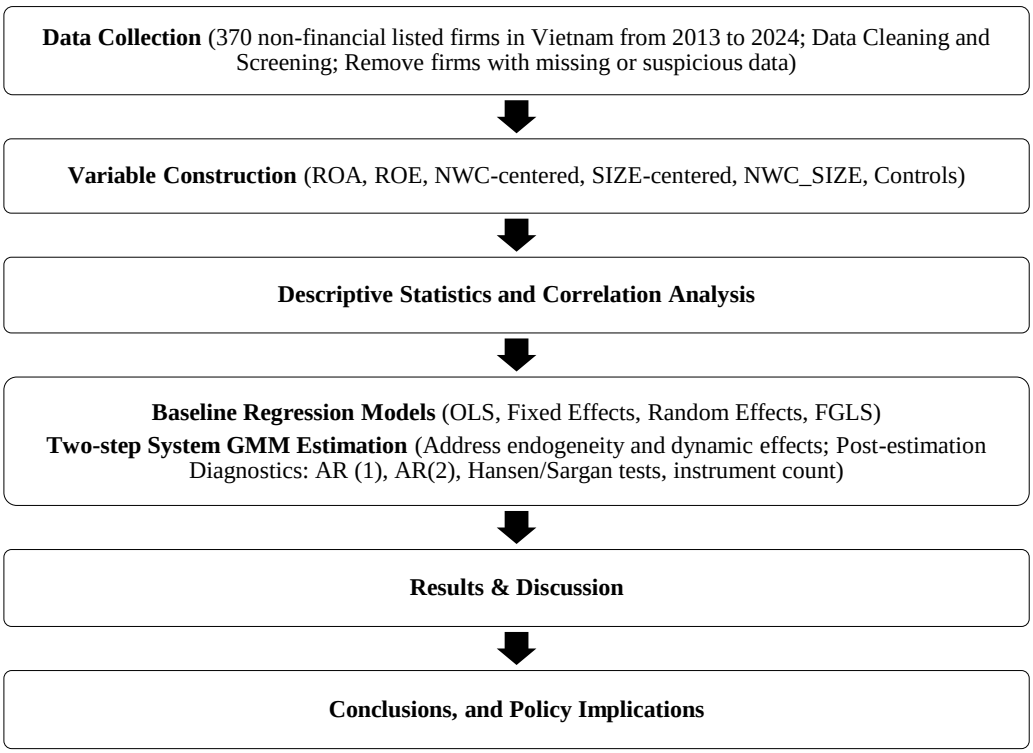

Figure 1. Research Workflow

4- Results and Discussion

4-1- Descriptive Statistics

Table 1 shows the basic characteristics of the variables in the data set, which includes 4,440 observations over 12 years for 370 listed companies during the research period. The variables were designed to examine the impact of net working capital (NWC) on financial performance and the moderating role of enterprise size.

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	4440	0.061	0.074	-0.853	0.784
ROE	4440	0.093	0.692	-40.821	1.587
NWCc	4440	1183.849	3.15E+12	-1.09E+14	4.67E+13
SIZEc	4440	0	0.684	-1.702	2.976
NWC SIZE	4440	5.73E+11	7.12E+12	-3.26E+14	9.32E+13
CASHD	4440	0.097	0.104	0	0.865
CFOTA	4440	0.061	0.126	-0.573	0.97
LEV	4440	0.479	0.217	0.003	1.294
LIQ	4440	2.536	3.627	0.097	79.584
GDP	4440	6.128	1.749	2.554	8.538
INF	4440	3.243	1.341	0.631	6.593

Regarding financial performance, ROA has an average of 6.1%, with a standard deviation of 0.074, indicating moderate variation among companies. The lowest ROA value is -0.853, reflecting some companies with significant losses, while the highest reaches 0.784. ROE averages 9.3%, but the standard deviation is quite high at 0.692, suggesting greater fluctuations in the efficiency of using equity capital; this aligns with the reality in the Vietnamese market, where many companies use high financial leverage, leading to substantial ROE variability.

The main independent variable, NWCc (centralized net working capital), has a mean value of 1,183,849 and a large standard deviation, indicating considerable differences in working capital management among firms. Its fluctuations range from very negative to large positive values, showing that some companies maintain negative net working capital for years—a common situation among firms heavily reliant on trade credit.

The moderating variable, NWC_SIZE, created by the interaction between NWCc and enterprise size (SIZEc), shows wide variation (mean 5.73E+11; SD 7.12E+12). This suggests that the marginal effect of NWC on financial performance can vary significantly depending on firm size, which is a core hypothesis of the study.

Among control variables, SIZEc has a mean of 0 because it is standardized around the log of total assets, with a standard deviation of 0.684, ensuring an appropriate distribution for models involving interactions. CASHD has a mean of 0.097 and low variation, indicating that firms tend to hold a relatively stable amount of cash relative to total assets. It averages 9.7%, reflecting the cash holdings typical of Vietnamese companies with relatively high liquidity needs. CFOTA averages 0.061, indicating that firms generally generate positive cash flow from operations, although there is notable variation. LEV averages 0.479, suggesting a moderate debt ratio of about 48% of total assets. LIQ has a mean of 2.536 with a large standard deviation of 3.627, indicating significant differences in short-term liquidity management strategies among firms. Macro variables such as GDP (average 6.128%) and INF (average 3.243%) reflect a stable economic environment during the studied period, characterized by consistent growth and controlled inflation.

Overall, the descriptive statistics reveal considerable variability in many financial variables, especially NWCc, ROE, LIQ, and the interaction terms. This suggests that the impact of net working capital on financial performance may vary greatly across firms and provides a strong foundation for testing the moderating effect of firm size in the research model.

4-2- Correlation Analysis and Multicollinearity Test

4-2-1- Correlation Analysis

The correlation matrix between variables (Table 2) reveals some important features. First, ROA − the dependent variable − is positively correlated with ROE (0.262, p<0.01) and CASHD (0.281, p<0.01), indicating that profitability is related to effective use of equity capital and cash holdings. Conversely, ROA shows a strong negative correlation with LEV (–0.432, p<0.01), suggesting that higher financial leverage is associated with lower operating performance, consistent with agency cost and financial distress theories.

Table 2. Matrix of correlations

Variables	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11
(1) ROA	1										
(2) ROE	0.262***	1									
(3) NWCc	0.101***	0.02	1								
(4) SIZEc	-0.056***	-0.001	0.267***	1							
(5) NWC_SIZE	0.072***	0.012	0.951***	0.089***	1						
(6) CASHD	0.281***	0.053***	0.023	-0.168***	0.024*	1					
(7) CFOTA	0.374***	0.065***	0.016	-0.062***	0.025*	0.230***	1				
(8) LEV	-0.432***	-0.083***	-0.087***	0.287***	-0.075***	-0.262***	-0.214***	1			
(9) LIQ	0.175***	0.019	0.039***	-0.184***	0.029*	0.173***	0.039***	-0.493***	1		
(10) GDP	0.02	-0.003	-0.007	-0.014	-0.009	0	-0.008	0.005	0.005	1	
(11) INF	-0.035**	-0.008	-0.017	-0.044***	-0.009	0.016	0.01	0.023	-0.022	0.038**	1

**** p<0.01, ** p<0.05, * p<0.1*

The main variable NWCc is positively correlated with ROA (0.101, p<0.01), implying that increased net working capital investments tend to correspond with better performance at the univariate level. However, correlation alone does not establish causality and should be tested with controlled regression models. Notably, NWCc and the interaction variable NWC_SIZE have a high correlation (0.951, p<0.01). This is expected since NWC_SIZE is calculated from NWCc × SIZEc. Centralizing both original variables before creating the interaction term addresses this inherent relationship and reduces unnecessary multicollinearity. Therefore, the high correlation between these variables is acceptable within a moderation model.

For the control variables, CASHD, CFOTA, and LIQ all exhibit positive correlations with ROA (ranging from 0.175 to 0.374, p<0.01), highlighting the beneficial effects of liquidity and cash flow on efficiency. Macro variables (GDP, INF) show very low correlations with internal variables (|r| < 0.04), as expected, considering macro data tend to fluctuate less across firms.

Overall, no pair of independent variables exceeds the concern threshold (|r| > 0.8), except for the inherent relationship between interaction variables and their components, which is addressed through centralization and is acceptable in interaction models. Thus, the correlation matrix indicates no serious multicollinearity issues, supporting the validity of the upcoming regression analyses.

4-2-2- Variance Inflation Factor (VIF) test

The VIF results show that multicollinearity is not a major issue in the model. For the model including interaction terms (NWCc × SIZEc), the average VIF is 4.76, with NWCc and NWC_SIZE showing VIFs of 17.61 and 16.14,

respectively. This is common in models with interaction variables, even when the original variables are centered. All other variables have VIFs below 2, indicating a stable model structure. When the interaction term is removed, the VIF of NWCc drops sharply to 1.11, and all other VIFs stay below 2, suggesting that multicollinearity mainly stems from the interaction term rather than the data itself. In summary, the results confirm that multicollinearity is not a concern in this study. Centralizing variables before creating the interaction term effectively reduces shared variance issues, ensuring precise regression estimates.

4-3- Regression Results and Discussion

Before proceeding with regression analysis, the study examined multicollinearity among the explanatory variables using the Variance Inflation Factor (VIF). The results showed no serious multicollinearity, allowing further estimation steps. The initial OLS estimate provided reference information on the direction of effects and the relative magnitudes of the coefficients. However, diagnostic tests revealed that the OLS model exhibited both autocorrelation and heteroscedasticity, rendering these estimates ineffective and unsuitable for drawing inferential conclusions. The results from the fixed-effects model (FEM) and the random-effects model (REM) showed that FEM was preferred for both financial performance measures, ROA and ROE, consistent with the Hausman test results. This implies that unobservable fixed characteristics of the firm play a significant role in explaining financial performance. However, further tests showed that the FEM was still affected by autocorrelation and heterogeneity, which degraded the efficiency of the estimates. In this case, the results from the FGLS model showed an improvement in statistical efficiency, but this method still did not completely address the endogeneity problem, which is common in corporate finance studies. Therefore, the main conclusions of the study are based on the results from the System-GMM model with Windmeijer-adjusted standard errors. Hansen and AR(2) tests confirmed the validity of the tool set and showed that there was no second-order autocorrelation in the errors.

The results from System-GMM showed that the impact of net working capital on financial performance was statistically significant and sustained across different model specifications. At the same time, the moderating role of firm size was confirmed, showing that the relationship between NWC and financial performance depended significantly on the size characteristics of the firm. These results were consistent with previous theoretical arguments and empirical evidence and reflected high reliability due to the simultaneous control for fixed effects, autocorrelation, heterogeneity, and endogeneity. Detailed regression results from the OLS, FEM, REM, FGLS, and System-GMM models are presented in Table 3 (for ROA) and Table 4 (for ROE).

Table 3. OLS, FEM, REM, FGLS, and GMM-Robust regression results for the ROA variable

Variables	OLS	FEM	REM	FGLS	GMM-Robust
L.ROA	-	-	-	-	0.8531*** -0.0896
NWCc	0.0000*** 0	0.0000** 0	0.0000*** 0	0.0000** 0	-0.0000*** 0
SIZEc	0.0035* (0.0019)	0.0044 (0.0049)	0.0037 -0.0028	0.0055*** -0.001	0.0274*** -0.0076
NWC_SIZE	-0.0000*** 0	-0.0000** 0	-0.0000*** 0	0 0	0.0000*** 0
CASHD	0.0971*** (0.0096)	0.0556*** (0.0104)	0.0716*** -0.0099	0.0591*** -0.006	0.0822*** -0.0305
CFOTA	0.1595*** (0.0078)	0.0521*** (0.0071)	0.0798*** -0.0071	0.0274*** -0.003	-0.0813 -0.0873
LEV	-0.1217*** (0.0054)	-0.1096*** (0.0085)	-0.1226*** -0.0068	-0.1265*** -0.003	-0.0737*** -0.0161
LIQ	-0.0007** (0.0003)	-0.0009*** (0.0003)	-0.0009*** -0.0003	-0.0007*** -3E-04	-0.0008* -0.0005
GDP	0.0011** (0.0005)	0.0010** (0.0004)	0.0011** -0.0004	0.0006*** -2E-04	0.0035*** -0.0012
INF	-0.0016** (0.0007)	-0.0015*** (0.0006)	-0.0015*** -0.0006	-0.0007*** -3E-04	-0.0011 -0.0011
Constant	0.1012*** (0.0051)	0.1065*** (0.0053)	0.1094*** -0.0051	0.1114*** -0.003	0.0222 -0.0141
Observations	4,440	4,440	4,440	4,440	4,070
R-squared	0.2981	0.0798			
Number of ID		370	370	370	370
Number of instruments = 22			Number of groups = 370		
Arellano-Bond test for AR(1) in first differences: z = -4.26 Pr > z = 0.000					
Arellano-Bond test for AR(2) in first differences: z = 1.41 Pr > z = 0.159					
Hansen test of overid. restrictions: chi2(11) = 8.82 Prob > chi2 = 0.639					

**** p<0.01, ** p<0.05, * p<0.1*

Table 4. OLS, FEM, REM, FGLS, and GMM − Robust regression results for the ROE variable

Variables	OLS	FEM	REM	FGLS	GMM–Robust
L.ROE	-	-	-	-	-1.576878*** (0.194)
NWCc	0 0	0 0	0 0	0 0	-0.000000** 0
SIZEc	0.013902 (0.020782)	0.036352 (0.067085)	0.015 (0.024)	0.023457*** (0.00299)	0.777117*** (0.255)
NWC_SIZE	0 0	0 0	0 0	0 0	0.000000** 0
CASHD	0.188168* (0.106278)	0.149118 (0.14275)	0.1825 (0.113)	0.094992*** (0.01124)	0.585462*** (0.139)
CFOTA	0.237700*** (0.08625)	0.014318 (0.096519)	0.180867** (0.088)	0.055754*** (0.00716)	-0.09 (0.09)
LEV	-0.263056*** (0.059903)	-0.309842*** (0.116459)	-0.272073*** (0.066)	-0.094994*** (0.00811)	-1.640800*** (0.412)
LIQ	-0.00515 (0.003302)	-0.004186 (0.004334)	-0.005 (0.003)	-0.001499*** (0.00042)	-0.007 (0.004)
GDP	-0.000563 (0.005914)	-0.000568 (0.005809)	-6E-04 (0.006)	0.001427*** (0.00037)	-2E-04 (0.003)
INF	-0.003375 (0.007728)	-0.002322 (0.007718)	-0.003 (0.008)	-0.001337** (0.00055)	-0.010888*** (0.003)
Constant	0.216506*** (0.056791)	0.250736*** (0.072953)	0.224074*** (0.058)	0.133070*** (0.00574)	0.853617*** (0.144)
Observations	4,440	4,440	4,440	4,440	4,070
R-squared	0.011243	0.002618			
Number of ID		370	370	370	370
Number of instruments = 14			Number of groups = 370		
Arellano-Bond test for AR(1) in first differences: z = -0.75 Pr > z = 0.453					
Arellano-Bond test for AR(2) in first differences: z = -1.23 Pr > z = 0.217					
Hansen test of overid. restrictions: chi2(3) = 0.52 Prob > chi2 = 0.914					

**** p<0.01, ** p<0.05, * p<0.1*

The results from the GMM-Robust model in Tables 3 and 4 show that the lagged variables (L.ROA in the ROA model) and L.ROE in the ROE model) are both statistically significant, confirming the dynamic nature of enterprise financial performance. Specifically, the coefficient on L.ROA is positive and highly significant (approximately 0.85), indicating that efficiency in asset utilization is sustainable over time. Conversely, the negative coefficient on L.ROE (approximately –1.58) eflects regression to the mean, in which enterprises with high ROE in one year tend to return to long-term profitability in the following year – a common characteristic in emerging markets [48, 49]. In this context, net working capital concentration (NWCc) has a negative coefficient and highly statistically significant in both the ROA and ROE models, suggesting that increases in net working capital above average degrade financial performance.

This result implies that overinvestment in short-term assets reduces the efficiency of asset and equity utilization. Although some static models (OLS, FEM, or GLS) show the impact of NWC to be unstable, the GMM-Robust results are consistent with studies using dynamic methods and endogenous controls, suggesting that holding working capital beyond optimal levels entails opportunity costs and inefficient capital allocation. Specifically, Deloof [9] noted an inverse relationship between working capital management and profitability in Belgium; Akgün & Memiş Karataş [6] found a negative impact of working capital investment in the EU-28 context; and Aktas et al. [7] provided evidence of optimal working capital levels in the US, beyond which profitability degrades. Therefore, these results strengthen the argument about the cost of holding working capital and extend empirical evidence to the Vietnamese context.

Regarding the moderating role of firm size, the interaction variable NWC_SIZE is positive and statistically significant in both the ROA and ROE models, indicating that firm size weakens the negative impact of net working capital on financial performance. As size increases, performance losses from maintaining high working capital levels decreases and may become neutral for very large firms. This finding is consistent with the argument that large firms have an advantage in working capital management due to better access to credit, bargaining power, and governance systems, consistent with the results of Kayani et al. [33].

The control variables in the GMM-Robust model are generally in line with theoretical expectations. Firm size (SIZEc) has a positive and highly statistically significant impact on ROE, suggesting that larger firms use equity more efficiently [17, 33, 34]. The cash ratio (CASHD) has a strong positive relationship with both ROA and ROE, supporting the hedging motive and the role of cash in enhancing financial flexibility [50]. Conversely, financial leverage (LEV) has a negative and statistically significant impact, particularly on ROE, reflecting high debt costs that undermine shareholder returns [17, 25, 50]. Short-term liquidity (LIQ) has a weak and less stable effect, suggesting that holding excessive liquid assets can reduce capital efficiency, consistent with Barney [43] but contrary to Anton & Afloarei Nucu [34].

Regarding macroeconomic variables, inflation (INF) negatively affects ROE, indicating that higher input and financing costs reduce shareholder returns, whereas economic growth (GDP) positively and statistically significantly affects ROA, reflecting the role of output and revenue expansion. However, GDP does not show a clear impact on ROE, implying that growth does not necessarily translate directly into shareholder returns in the context of increased investment and leverage.

Overall, the empirical results support the hypothesis of a trade-off between liquidity, leverage, and profitability, highlighting the importance of optimizing working capital. Specifically, (i) high net working capital reflects large investments in short-term assets but reduces capital efficiency; (ii) slow collection of receivables or maintaining large inventories increases opportunity costs; and (iii) optimizing working capital policy is a key condition for improving profitability. These findings are generally consistent with international studies [9, 14] and evidence from emerging markets, and provide new empirical contributions for listed companies in Vietnam.

Figures 2 and 3 illustrate how firm size influences the relationship between net working capital (NWCc) and financial performance. Both figures show that NWCc negatively impacts ROA and ROE, but the degree of this effect varies with firm size, highlighting the moderating role of SIZEc. For ROA (Figure 2), small firms (SIZEc = –2 SD) are most negatively affected, as indicated by a steep negative slope. This may result from challenges in managing working capital and higher financing costs that make large NWC burdensome. As firm size increases to the average level (SIZEc = 0), the negative impact diminishes significantly; for large firms (SIZEc = +2 SD), the trend line is nearly flat, suggesting that increasing NWCc no longer substantially reduces ROA due to economies of scale and better operational efficiency. This confirms that SIZEc moderates the negative effect of NWCc on asset efficiency.

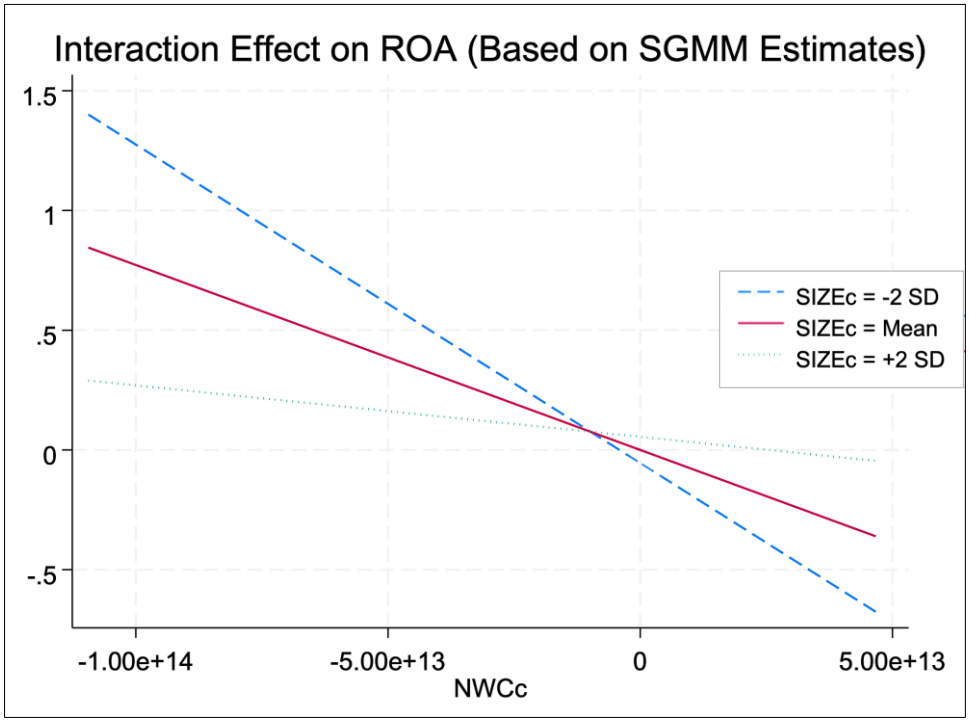

Figure 2. Moderating effect of firm size on the relationship between NWCc and ROA

Figure 3 shows a similar pattern but with a stronger impact on ROE. The negative effect of NWCc on ROE is much more pronounced, especially for small firms (SIZEc = –2 SD), aligning with the fact that ROE is highly sensitive to return risk and equity efficiency. At SIZEc = 0, the impact lessens, and at SIZEc = +2 SD, the trend line is nearly horizontal, indicating that larger firms can almost eliminate the adverse effect of NWCc through improved governance and risk management.

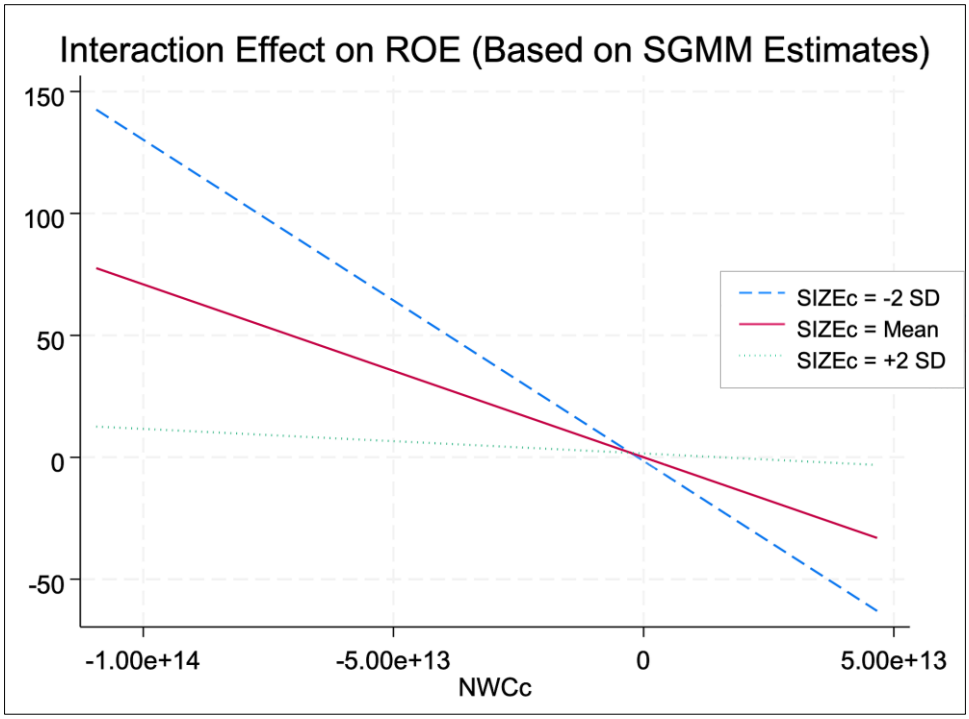

Figure 3. Moderating effect of firm size on the relationship between NWCc and ROE

The study's empirical results yield several important implications for the theory and practice of working capital management. First, the finding that excess net working capital negatively affects operational efficiency shows that increasing working capital is not always beneficial, especially in emerging markets. This reinforces the argument that businesses need to identify and maintain optimal working capital levels rather than passively pursue a working capital accumulation strategy.

Second, the positive role of firm size indicates that large businesses have a distinct advantage in translating short-term financial decisions into operational efficiency. However, the finding that firm size moderates this relationship underscores that working capital management strategies need to be tailored to firm size rather than applied uniformly across all businesses.

Finally, empirical evidence from the GMM-Robust model suggests that considering conditional factors, such as firm size, better explains inconsistencies in previous studies on the relationship between working capital and operational efficiency. This contributes to a broader understanding of the mechanisms of working capital impact in emerging markets and opens up new avenues for future research.

4-4- Robustness Checks

To ensure the reliability and consistency of the main estimation results, the study conducts several robustness tests from different angles. These tests determine whether the relationship between net working capital (NWC) and financial performance, along with the moderating influence of firm size, remains stable when changing the measure, model specification, or estimation method.

In addition to ROA used in the main model, the study also employs another financial performance measure, ROE, to verify if the results depend on the specific metric. For ROE, the sign and statistical significance of NWC and the NWC × SIZE interaction stay consistent, indicating that the impact remains stable even when shifting from an asset efficiency measure to an equity efficiency measure. This supports the argument that net working capital plays an important role in firm performance across different accounting and market perspectives.

Alongside the main model, the study runs several alternative estimations:

- Pooled OLS,
- Fixed Effects (FE),
- Random Effects (RE),
- FGLS (for large samples to address autocorrelation and heteroscedasticity),

The results show that the NWC coefficients and the NWC × Size interaction coefficients remain similar in sign and significance in most models. This confirms that the observed impact is not solely dependent on a specific estimation approach.

For the dynamic model using System GMM, the study tested:

- AR(1) < 0.05 and AR(2) > 0.05, indicating no second-order autocorrelation in the error term.
- Hansen test > 0.05, confirming the validity of the instrument set and the absence of redundancy.

When varying the instrument set (such as limiting the number of lags or reducing the number of instruments), the coefficients for NWC and the NWC × Size interaction remain stable in both sign and significance. This further supports the robustness of the main findings, demonstrating they are not affected by instrument misuse.

In summary, all robustness tests confirm that the main conclusions—namely, the positive effect of NWC on financial performance and the moderating impact of firm size—are consistently supported, thereby validating the reliability and strength of the empirical results.

5- Conclusions and Implications

5-1- Main Conclusions

This study assesses the impact of net working capital (NWC) on the financial performance of publicly listed Vietnamese companies from 2013 to 2024. It investigates the moderating effect of firm size (SIZE) using a dynamic GMM model with robust standard errors and serial-correlation adjustments. The empirical results consistently reveal a key characteristic of Vietnamese firms: high NWC is associated with lower performance, as indicated by both ROA and ROE. The highly significant negative coefficients for NWC across all GMM models suggest that holding substantial current assets or reducing short-term financing increases opportunity costs and decreases profits.

Another important finding is that firm size significantly affects the relationship between NWC and financial performance. The coefficient for the interaction term NWC×SIZE is positive and significant, indicating that larger firms are better able to offset the negative effects of high NWC through economies of scale, greater bargaining power, and more advanced cash-flow management systems. This highlights that working capital management strategies are not "one-size-fits-all" but vary across firms.

The control variables yield effects consistent with both theory and the Vietnamese economic environment: LEV decreases financial performance, whereas SIZE, CASHD, and GDP growth enhance it; LIQ reduces performance, and inflation (INF) appears insignificant. The AR(1), AR(2), and Hansen tests all meet the necessary criteria, confirming the appropriateness of the model and the instruments used in the GMM.

5-2- Discussion

The findings suggest that NWC diminishes financial performance, aligning with the Trade-off Theory. According to this theory, firms balance the benefits (reducing liquidity risk) against the costs (lower capital efficiency) of maintaining high working capital levels. In Vietnam, where inventory turnover times are long, collection periods are extended, and capital costs are high, the negative impact of NWC is even more pronounced. These results are consistent with international studies [9, 14].

The insights regarding the moderating role of SIZE carry significant theoretical implications. Larger firms generally have better access to credit, lower capital costs, and more sophisticated cash flow management systems; therefore, they manage working capital more effectively. This aligns with both Trade-off Theory (economies of scale) and Pecking Order Theory, which suggest that large firms tend to have more transparent information and are less affected by information asymmetry, making NWC adjustments less harmful to financial performance.

The negative effects of LEV and LIQ also support the Pecking Order Theory. Under conditions of information asymmetry, firms that rely heavily on short-term debt tend to incur higher financial costs and face greater liquidity risks, thereby reducing profitability. Conversely, the positive effects of CASHD and GDP indicate that financial performance improves significantly when firms maintain healthy cash flows and operate within a favorable economic environment.

In summary, the results indicate that Vietnamese firms' financial performance depends not only on their long-term financing choices but also on how effectively they manage working capital in an environment characterized by high capital costs and a less developed credit market.

5-3- Management and Policy Implications

Based on the findings above, the study outlines three main groups of implications for managers, policymakers, and investors. For business managers, it is crucial to review their NWC management strategies. Maintaining excessively high NWC can directly harm ROA and ROE, so NWC optimization rather than mechanical expansion is necessary. This includes: (i) reducing the collection cycle through trade credit policies and digital technology; (ii) adopting a lean inventory model; (iii) utilizing short-term financing instead of holding excess current assets. Second, a working capital management mechanism suited to the company's size should be established. Large firms have the capacity to leverage negotiating power with suppliers, standardize supply chains, or implement ERP systems to optimize working capital. Conversely, small businesses should focus on improving cash flow efficiency rather than expanding short-term assets. Third, companies should be cautious about overusing financial leverage, especially short-term debt, as LEV has a consistently strong negative impact on both ROA and ROE across all estimation models.

For policymakers, emphasis should be placed on improving access to high-quality credit, particularly short-term credit, for businesses. Promoting digitalization (such as e-invoices, e-logistics, and electronic payment platforms) can also help reduce the working capital cycle across the economy. Additionally, establishing a support mechanism for SMEs in working capital management is crucial, given this group's heightened sensitivity to high NWC and capital costs.

For investors, a high NWC should not be seen as a sign of safety; instead, it may indicate inefficient capital use. Large enterprises with strong cash flow and effective working capital management tend to generate higher, more stable profits.

5-4- Limitations and Future Research Directions

Although this study provides new empirical evidence on the relationship between net working capital and firm performance, it has certain limitations:

- First, the study constructs a theoretical framework that combines the Trade-off Theory and the Priorities Theory; however, the relative importance of each theory may vary across contexts. Future studies could more clearly delineate the conditions under which each theory applies, such as the firm's degree of financial constraint.
- Second, the study focuses on a moderated linear relationship between net working capital and performance. Future research could extend this by testing for nonlinear forms of the relationship or optimal working capital levels, and by examining the moderating role of firm characteristics.
- Third, net working capital and firm size are measured using common metrics. Alternative measures could be used in future work to assess the sustainability of the results.
- Finally, the use of balanced data samples increases the reliability of the estimates but may limit generalizability, opening avenues for future research with unbalanced panel data.

6- Declarations

6-1- Data Availability Statement

The data supporting this study's findings are publicly available from the State Securities Commission of Vietnam, the Hanoi and Ho Chi Minh Stock Exchanges, and the World Bank [44-46, 51]. Therefore, no proprietary or confidential data is shared.

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6-4- Institutional Review Board Statement

Not applicable.

6-5- Informed Consent Statement

Not applicable.

6-6- Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the author.

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