

WORKING CAPITAL MANAGEMENT AND PROFITABILITY OF INDONESIAN MANUFACTURING FIRMS: THE MODERATING ROLE OF FIRM SIZE

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Abstract: *This study examines the relationships between working capital management and profitability among IDX-listed manufacturing firms in Indonesia and tests the moderating role of Firm Size. Working capital management is assessed using the Cash Conversion Cycle (CCC) and Current Ratio (CR), while profitability is measured by Return on Assets (ROA). The study uses 75 firm-year observations from 15 manufacturing firms during 2021–2025. To account for the panel structure of the data, the study estimates a two-way fixed-effects panel regression with firm and year fixed effects and standard errors clustered at the firm level. The results show that CCC has a negative but statistically insignificant association with ROA ($\beta = -0.046$, $p = 0.356$), while CR has a positive but statistically insignificant association with ROA ($\beta = 0.669$, $p = 0.104$). Firm Size does not significantly moderate the CCC–ROA relationship ($\beta = -0.006$, $p = 0.862$) or the CR–ROA relationship ($\beta = 0.154$, $p = 0.626$). The findings indicate that the relationships between working capital measures and profitability are not statistically significant in the sampled firms after accounting for firm- and year-specific effects. The study contributes to the literature by examining working capital efficiency, liquidity, and Firm Size within a panel-data framework in Indonesian manufacturing firms.*

Keywords: *Current Ratio, Firm Size, Indonesia, Manufacturing Firm, Profitability*

Introduction

Working capital management is a central element of short-term financial management because firms must preserve sufficient liquidity for operating continuity while avoiding excessive investment in inventories, receivables, cash, and other current assets that may reduce their returns (Reddy & Sravanthi, 2026). This liquidity–profitability trade-off is especially relevant to manufacturing firms, where production and distribution activities require continuous financing of raw materials, work-in-process, finished goods, trade receivables, and supplier obligations (Rodriguez et al., 2024). The Cash Conversion Cycle (CCC) captures the time required for operating cash committed to inventory and receivables to return to the firm after considering supplier payment timing. A shorter CCC is commonly interpreted as a faster cash recovery and lower working capital financing requirements (Griffin et al., 2014).

However, recent empirical evidence shows that the relationship between CCC and profitability is not uniform. Kiymaz et al. (2024) report an inverse association between CCC and firm performance across developed and emerging economies, while Soukhakian and Khodakarami (2019) document a negative CCC–return on assets (ROA) relationship among listed Iranian manufacturing firms. Ahmad et al. (2022) further show that working capital effects vary with economic conditions and the performance measure employed, whereas Hung and Su Dinh (2022) indicate that the relationship may be nonlinear or threshold-dependent.

Liquidity constitutes the second dimension of working capital policy. Adequate current assets can support the timely payment of short-term obligations and reduce the risk of operational disruption; however, excessive liquidity may create opportunity costs when resources remain tied to low-yielding assets (Petriashvili, 2017). Evidence from listed manufacturing firms also suggests that the Current Ratio may be positively associated with profitability, although the magnitude and significance of this relationship vary across samples and institutional settings (Tinus et al., 2024). A plausible explanation for these mixed results is the heterogeneity of firms. Larger and smaller firms may differ in financing access, bargaining power, operating complexity, credit policies, inventory intensity, and the scale of capital committed to working capital (Banerjee and Dutta, 2023). The 2021–2025 period also exposed Indonesian manufacturers to changing operating and financing conditions. During the post-pandemic recovery, global supply-chain disruptions, higher international commodity prices, and rising inflation created pressure on production costs and working-capital requirements. Bank Indonesia reported that supply-chain disruptions and higher international commodity prices intensified inflationary pressures in 2022, while Indonesia’s consumer price inflation reached 4.35% in June 2022 (Bank Indonesia, 2022a). Bank Indonesia subsequently raised its policy rate to 5.50% by December 2022 amid persistent inflationary pressures and global financial uncertainty (Bank Indonesia, 2022b). At the same time, manufacturing activity remained in an expansionary phase, with the manufacturing PMI recorded at 50.06% in the fourth quarter of 2022, supported particularly by developments in order volume, inventory, and production volume (Bank Indonesia, 2023). These conditions increased the importance of managing inventories, receivables, supplier payments, and short-term financing efficiently while maintaining production continuity.

Dalci et al. (2019) demonstrate that firm size significantly moderates the CCC–profitability relationship, implying that the economic consequences of working capital decisions should not be assumed to be homogeneous across all firms. The Indonesian manufacturing setting offers a relevant context for examining this issue because manufacturing represents a substantial component of the Indonesian listed-company sector. Using data on publicly listed non-financial

firms in Indonesia, Sahminan (2021) reports that manufacturing accounted for 35% of total assets, 32% of total liabilities, and 46% of total sales in 2020, making it the largest economic sector in the sample. This substantial presence, together with variation in firm characteristics, provides a meaningful setting for examining whether firm scale conditions the relationship between working capital management and profitability.

Despite the growing working capital literature, limited evidence simultaneously distinguishes operating cycle efficiency from balance sheet liquidity and tests whether firm size conditions both relationships with profitability in Indonesian manufacturing firms (Ahmad et al., 2022). Based on this gap, this study addresses two research questions: (1) How are Cash Conversion Cycle (CCC) and Current Ratio associated with Return on Assets (ROA) among IDX-listed manufacturing firms during 2021–2025? (2) Does Firm Size moderate the relationships between CCC and ROA and between Current Ratio and ROA? In line with these questions, the study aims to examine the relationships of CCC and Current Ratio with firm profitability, measured by ROA, and to test whether Firm Size moderates each of these relationships. Using 75 firm-year observations from 15 IDX-listed manufacturing firms during 2021–2025, the study makes three contributions to the literature and practice. First, it provides empirical evidence on the relationships between working capital management, measured by CCC and Current Ratio, and profitability in Indonesian manufacturing firms. Second, it extends the literature by examining Firm Size as a moderator of these relationships. Third, it provides practical insights for managers regarding the importance of working capital decisions in relation to firm profitability across different firm sizes.

Literature Review and Hypothesis Development

The theoretical foundation of this study is the financial management perspective on the liquidity–profitability trade-off and working capital efficiency. Firms must maintain sufficient current assets to support continuous operations and meet short-term obligations, but excessive investment in working capital can increase the amount of funds tied up in relatively low-yield assets and raise financing or holding costs (Brigham & Houston, 2022; Kiymaz et al., 2024). From this perspective, working capital management affects profitability through the efficiency with which firms convert operating resources into cash and allocate liquidity to productive activities. The Cash Conversion Cycle captures the operating-cycle dimension of this mechanism, while the Current Ratio captures the balance-sheet liquidity dimension.

Cash Conversion Cycle and Return on Assets

The CCC integrates inventory holding, receivable collection, and payable deferral periods into a single measure of the duration for which operating funds remain committed before returning to the firm as cash (Harnathka, 2023). From a working capital efficiency perspective, a prolonged CCC may increase financing and holding costs and delay fund redeployment into productive activities. Conversely, a faster conversion can reduce the amount of capital tied to day-to-day operations (Asman et al., 2022). Empirical evidence generally supports the economic relevance of this mechanism, although its linearity or statistical significance is not always evident. Kiymaz et al. (2024) report negative CCC–performance relationships, while Hung and Su Dinh (2022) document nonlinear threshold effects. This mixed evidence suggests that the direction predicted by working capital efficiency theory may coexist with substantial heterogeneity across firms and contexts.

H1: The Cash Conversion Cycle has a negative effect on ROA.

Current Ratio and Return on Assets

The Current Ratio reflects the capacity of current assets to cover current liabilities and, therefore, captures the short-term liquidity position of the firm (Geeta and Nagasivanand, 2021). Adequate liquidity can support profitability by reducing payment pressure, avoiding costly disruptions, and maintaining access to inventory and production inputs. However, overly high liquidity may signal inefficient deployment of current assets (Rodriguez et al., 2024). This trade-off implies that liquidity can support profitability when current assets are sufficient for operating needs without becoming persistently inactive. Evidence from listed manufacturing firms has reported positive Current Ratio–profitability relationships, although findings across studies remain mixed (Wibowo, 2024).

H2: The Current Ratio has a positive effect on ROA.

Firm Size as a Moderator

Firm Size may alter the profitability consequences of working-capital decisions because organizational scale can influence financing access, bargaining power, treasury sophistication, inventory systems, customer credit management, and the absolute amount of capital exposed to operating cycle inefficiency (Madhou et al., 2015). From an economies-of-scale and financial-flexibility perspective, larger firms may have greater access to external financing, stronger bargaining positions with suppliers and customers, and more formalized systems for managing inventories, receivables, and payables. These advantages can reduce financing constraints and improve the coordination of working-capital activities (Brigham & Houston, 2022).

However, greater scale also means that inefficient working-capital management can involve a larger absolute amount of capital. In manufacturing firms, a prolonged CCC may therefore tie up substantial funds in inventories and receivables for longer periods, increasing financing and holding costs and delaying the redeployment of resources into productive activities. Consequently, the profitability implication of a given CCC may differ across firms of different sizes. Dalci et al. (2019) provide direct evidence that Firm Size moderates the relationship between working capital management and profitability, while Mandalaputri et al. (2021) suggest that the scale of operating activities can affect the consequences of working-capital inefficiency. Thus, Firm Size can be understood as a boundary condition through which the operating-cycle efficiency mechanism may vary across firms.

H3: Firm Size moderates the relationship between the Cash Conversion Cycle and ROA.

Firm Size may also condition the liquidity–profitability relationship represented by the Current Ratio. Larger firms generally have broader financing access and more sophisticated cash-management systems, which may reduce the importance of maintaining large precautionary liquidity buffers. Smaller firms, by contrast, may rely more heavily on internal liquidity to absorb payment delays, operating disruptions, or limited access to external financing (Kakhbod et al., 2025). At the same time, maintaining excessive current assets can create opportunity costs because funds remain invested in relatively low-return assets. Therefore, the profitability implication of a given Current Ratio may differ according to firm size, although the direction and magnitude of this moderating effect remain an empirical question.

H4: Firm Size moderates the relationship between the Current Ratio and ROA.

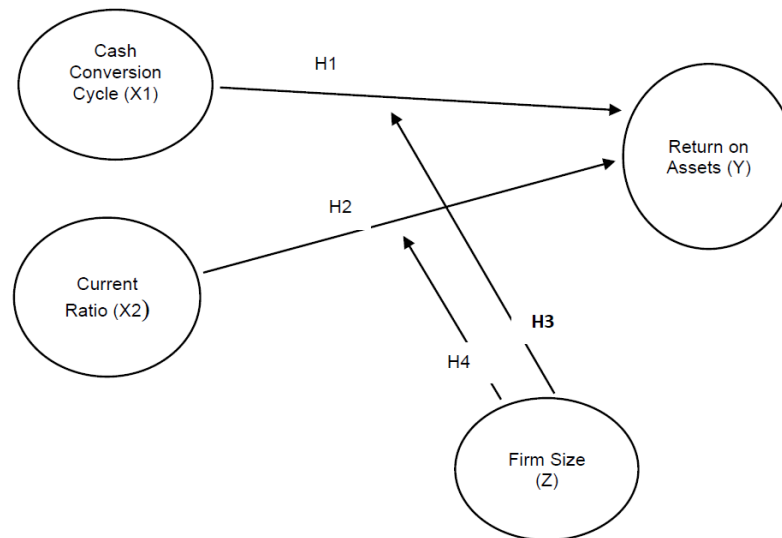


Figure 1: Hypothesis

Methodology

Research Design, Population, And Sample

This study uses a quantitative explanatory design based on secondary financial data from the annual reports and audited financial statements of manufacturing companies listed on the Indonesia Stock Exchange. Purposive sampling was used to select firms that met the following criteria: (1) the firm was classified as a manufacturing company and listed on the Indonesia Stock Exchange throughout the 2021–2025 observation period; (2) the firm had annual reports and audited financial statements available for all five observation years; and (3) the reported financial information was sufficiently complete to calculate Cash Conversion Cycle (CCC), Current Ratio (CR), Return on Assets (ROA), and Firm Size consistently across the observation period. Based on these criteria, 15 firms were retained for the analysis. Five annual observations for each firm from 2021 to 2025 yielded a balanced panel dataset of 75 firm-year observations. Because the dataset contains repeated observations for the same firms over five years, the analysis treats the data as panel data rather than as independent pooled observations. To account for unobserved firm-specific characteristics and common year-specific effects, the study estimates a two-way fixed-effects panel regression with firm and year fixed effects. Standard errors are clustered at the firm level to account for within-firm dependence over time. The panel specification is used to estimate the relationships between CCC, CR, Firm Size, and ROA and the interaction effects of Firm Size with CCC and CR.

Variable Measurement

The operational definitions follow the financial statement formulas used in the thesis dataset. ROA is calculated using the average total assets, while CCC uses the average inventory, trade receivables, and trade payables to maintain consistency across annual observations.

Table 1: Variable Measurement

Variable	Role	Operationalization	Formula
Cash Conversion Cycle (CCC)	Independent	Operating-cycle efficiency	DIO + DSO – DPO
Current Ratio (CR)	Independent	Short-term liquidity	Current Assets / Current Liabilities
Return on Assets (ROA)	Dependent	Profitability	Net Income / Average Total Assets × 100%
Firm Size (FS)	Moderator	Organizational scale	Ln (Total Assets)
CCC × FS	Interaction	Moderation of CCC–ROA	Centered CCC × Centered FS
CR × FS	Interaction	Moderation of CR–ROA	Centered CR × Centered FS

Note: Data Compiled from the Annual Reports and Audited Financial Statements of the Sampled Firms For 2021–2025

Model Specification and Estimation

The moderation model is specified as follows:

$$ROA_{it} = \beta_0 + \beta_1 CCC_{it} + \beta_2 CR_{it} + \beta_3 FS_{it} + \beta_4 (CCC_{it} \times FS_{it}) + \beta_5 (CR_{it} \times FS_{it}) + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where ROA_{it} represents Return on Assets of firm i in year t ; CCC_{it} represents Cash Conversion Cycle; CR_{it} represents Current Ratio; FS_{it} represents Firm Size; $CCC_{it} \times FS_{it}$ and $CR_{it} \times FS_{it}$ represent the interaction terms for the moderation hypotheses; μ_i represents firm fixed effects; λ_t represents year fixed effects; and ε_{it} represents the error term. Standard errors are clustered at the firm level.

The model is estimated using two-way fixed-effects panel regression, with firm and year fixed effects included to account for unobserved firm-specific characteristics and common year-specific effects. Standard errors are clustered at the firm level to account for within-firm dependence over time. The estimation evaluates the direct effects of CCC and CR on ROA and the interaction effects of Firm Size with CCC and CR. The analysis reports regression coefficients, clustered standard errors, t-statistics, p-values, and model explanatory power.

Results

Descriptive Statistics

The mean CCC is 71.127 days, with observations ranging from –29.124 to 164.776 days, indicating substantial heterogeneity in the operating cycle length. The Current Ratio averages 3.080 and ranges from 0.446 to 10.882. Firm Size averages 16.256, while ROA averages 11.118% and ranges from –4.087% to 42.376%. The dispersion across the variables provides adequate empirical variation for testing the proposed relationships.

Table 2: Descriptive Statistics

Variable	Minimum	Maximum	Mean	SD
CCC	-29.124	164.776	71.127	39.375
Current Ratio	0.446	10.882	3.080	2.158
Firm Size	13.698	19.200	16.256	1.485
ROA (%)	-4.087	42.376	11.118	8.890

Note: Data Compiled from the Annual Reports and Audited Financial Statements of the Sampled Firms For 2021–2025

Panel Regression Results

The panel regression results are presented using a two-way fixed-effects specification with firm and year fixed effects and standard errors clustered at the firm level. The model uses 75 firm-year observations from 15 manufacturing firms over the 2021–2025 period. The results show that the coefficient of CCC is negative ($\beta = -0.046$, $p = 0.356$), while the coefficient of CR is positive ($\beta = 0.669$, $p = 0.104$). Neither relationship is statistically significant at the 5% level. The CCC $\times$ Firm Size interaction is negative and statistically insignificant ($\beta = -0.006$, $p = 0.862$), while the CR $\times$ Firm Size interaction is positive and statistically insignificant ($\beta = 0.154$, $p = 0.626$). Firm Size itself is also statistically insignificant ($\beta = -0.733$, $p = 0.859$). The two-way fixed-effects model produces an R^2 of 0.909 and an adjusted R^2 of 0.867.

Multicollinearity was assessed using the Variance Inflation Factor (VIF) based on the centered predictors and interaction terms used in the final panel model. The individual VIF values were 1.205 for CCC, 1.770 for Current Ratio, 1.230 for Firm Size, 1.067 for Firm Size $\times$ CCC, and 1.649 for Firm Size $\times$ CR. All values are below the commonly used threshold of 5, indicating no evidence of severe multicollinearity among the model predictors.

Table 3: Variance Inflation Factor (VIF)

Predictor	VIF
CCC	1.205
CR	1.770
Firm Size $\times$ CCC	1.067
Firm Size $\times$ CR	1.649
Firm Size	1.230

Note: VIF Values Below 5 Indicate No Serious Multicollinearity

Table 4: Two-Way Fixed-Effects Panel Regression Results

Variable	Coefficient (β)	Clustered SE	t-statistic	p-value
CCC	-0.046	0.050	-0.922	0.356
Current Ratio	0.669	0.412	1.625	0.104
Firm Size	-0.733	4.123	-0.178	0.859
CCC $\times$ Firm Size	-0.006	0.035	-0.174	0.862
CR $\times$ Firm Size	0.154	0.316	0.487	0.626
Observations	75			
Firms	15			
Firm Fixed Effects	Yes			
Year Fixed Effects	Yes			
R^2	0.909			
Adjusted R^2	0.867			

Note: Standard Errors Are Clustered at The Firm Level. The Model Is Estimated Using Two-Way Fixed Effects with Firm and Year Fixed Effects

The two-way fixed-effects results indicate that none of the hypothesized relationships is statistically significant at the 5% level. The coefficient of CCC is negative but insignificant ($\beta = -0.046$, $p = 0.356$), providing no statistical support for H1. The coefficient of CR is positive but insignificant ($\beta = 0.669$, $p = 0.104$), so H2 is not supported. The interaction between CCC and Firm Size is negative but statistically insignificant ($\beta = -0.006$, $p = 0.862$), providing no support for H3. Similarly, the interaction between CR and Firm Size is positive but statistically insignificant ($\beta = 0.154$, $p = 0.626$), so H4 is not supported.

Discussion

Cash Conversion Cycle and Profitability

The two-way fixed-effects results show a negative but statistically insignificant relationship between CCC and ROA ($\beta = -0.046$, $p = 0.356$). This indicates that longer cash conversion periods are directionally associated with lower profitability, but the evidence is insufficient to conclude that CCC is significantly associated with ROA among the sampled manufacturing firms. The negative direction is consistent with the view that longer operating cycles may tie up funds in inventories and receivables, but the absence of statistical significance suggests that this relationship is not uniform across the firms and years examined. This finding is broadly consistent with studies reporting weak or context-dependent relationships between working capital efficiency and profitability (Hung & Su Dinh, 2022; Soukhakian & Khodakarami, 2019).

The insignificant CCC coefficient may also reflect differences in the components of the operating cycle across manufacturing firms. The CCC combines Days Inventory Outstanding (DIO), Days Sales Outstanding (DSO), and Days Payables Outstanding (DPO), which capture inventory holding, receivable collection, and payment periods, respectively. Differences in production cycles, inventory intensity, customer credit terms, and supplier arrangements may cause these components to contribute differently to profitability (Asman et al., 2022). Because this study estimates the composite CCC rather than testing DIO, DSO, and DPO separately, these mechanisms should be interpreted as possible explanations rather than causal findings.

Current Ratio and Profitability

The two-way fixed-effects results show a positive but statistically insignificant relationship between Current Ratio and ROA ($\beta = 0.669$, $p = 0.104$). Although the positive coefficient suggests that higher short-term liquidity is directionally associated with higher profitability, the p-value exceeds the 5% significance level. Therefore, the results do not provide sufficient statistical evidence to conclude that Current Ratio is significantly associated with profitability in the sampled manufacturing firms. This finding is consistent with previous studies reporting that liquidity does not necessarily translate into higher profitability, particularly when firms maintain current assets beyond the level required for efficient operations (Bukit et al., 2023; Sitohang & Akbar, 2024).

The result can also be interpreted through the liquidity–profitability trade-off. Maintaining sufficient current assets can support operational continuity and the settlement of short-term obligations, but excessive liquidity may leave funds tied up in relatively low-return assets. The insignificant relationship observed in this study suggests that the profitability implications of liquidity may depend on how effectively firms deploy their current assets rather than on the level of Current Ratio alone.

Firm Size as a Moderator of the CCC–ROA Relationship

The interaction between CCC and Firm Size is negative but statistically insignificant ($\beta = -0.006$, $p = 0.862$). Therefore, the results do not provide statistical support for H3 and do not indicate that Firm Size significantly moderates the relationship between CCC and ROA in the sampled manufacturing firms. Although the negative coefficient is directionally consistent with the possibility that the profitability implications of a longer cash conversion cycle may differ across firms of different sizes, the interaction estimate is too uncertain to support this interpretation statistically.

The absence of a significant moderation effect may also reflect the composite nature of CCC. CCC is calculated as $DIO + DSO - DPO$, meaning that inventory holding, receivable collection, and supplier-payment periods are combined into a single measure. Firm size may influence these components differently through differences in purchasing arrangements, inventory-management systems, customer credit policies, and supplier bargaining positions. For example, larger firms may have different inventory systems or payment terms than smaller firms, but the effects across DIO, DSO, and DPO could offset one another when combined into the overall CCC measure. Because the present study does not separately estimate the interactions between Firm Size and DIO, DSO, or DPO, these mechanisms remain possible explanations rather than tested causal mechanisms.

Firm Size as a Moderator of the CR–ROA Relationship

The interaction between CR and Firm Size is positive but statistically insignificant ($\beta = 0.154$, $p = 0.626$). Therefore, the results do not provide statistical support for H4 and do not indicate that Firm Size significantly moderates the relationship between Current Ratio and ROA in the sampled manufacturing firms. Although the positive coefficient suggests that the relationship between liquidity and profitability may differ across firm sizes, the statistical evidence is insufficient to establish a moderation effect.

This finding suggests that firm scale alone may not determine how liquidity affects profitability. Larger firms may have greater access to financing and more developed financial-management systems, while smaller firms may depend more heavily on internally available liquidity. However, these potential differences do not translate into a statistically significant interaction in the present sample. The result therefore supports a cautious interpretation in which the profitability implications of liquidity depend on broader firm-specific and operating conditions rather than Firm Size alone.

Conclusion, Implications, And Future Research

This study examines the relationships between working capital management and profitability and tests the moderating role of Firm Size using 75 firm-year observations from 15 Indonesian manufacturing firms during 2021–2025. Using a two-way fixed-effects panel regression with firm and year fixed effects and firm-clustered standard errors, the results show that CCC has a negative but statistically insignificant association with ROA ($\beta = -0.046$, $p = 0.356$), while CR has a positive but statistically insignificant association with ROA ($\beta = 0.669$, $p = 0.104$). Firm Size does not significantly moderate the CCC–ROA relationship ($\beta = -0.006$, $p = 0.862$) or the CR–ROA relationship ($\beta = 0.154$, $p = 0.626$). Accordingly, none of the four hypotheses is supported under the panel specification.

The findings contribute to the working capital literature by showing that the relationships between operating-cycle efficiency, balance-sheet liquidity, and profitability are not

statistically significant in this sample once firm-specific and year-specific effects are taken into account. The results also indicate that Firm Size does not provide statistically significant moderation of either relationship during the observation period. The absence of significant effects should not be interpreted as evidence that working capital decisions are irrelevant; rather, it suggests that their profitability implications may depend on firm-specific, operational, and temporal conditions that are not fully captured by the aggregate measures used in this study.

Managerial And Practical Implications

For managers of manufacturing firms, the findings suggest that working capital decisions should be evaluated in relation to the firm's operating conditions rather than relying on CCC or Current Ratio as standalone indicators of profitability. Managers should monitor inventory holding periods, receivable collection, and supplier-payment periods as components of CCC, while maintaining sufficient liquidity to support operational continuity. Because the study does not identify a statistically significant Firm Size moderation effect, managers should avoid assuming that working capital policies automatically produce different profitability outcomes solely because firms differ in scale.

Policy And Regulatory Implications

From a policy and regulatory perspective, the findings support continued attention to financial transparency and the availability of reliable information on firms' liquidity and working capital positions. Regulators and market institutions may encourage consistent financial reporting of inventories, receivables, payables, and current liabilities so that investors and other stakeholders can better assess firms' short-term financial conditions. However, the insignificant relationships identified in this study do not provide a basis for prescribing a uniform working capital policy across manufacturing firms.

Limitations And Future Research

The study is limited by its sample of 15 manufacturing firms, five-year observation period, and single-country manufacturing setting. In addition, the analysis uses aggregate measures of CCC and liquidity rather than separately estimating the effects of DIO, DSO, and DPO or other working capital components. Future research could extend the observation period, increase the sample size, compare manufacturing subsectors, incorporate additional firm-level and macroeconomic controls, and separately examine DIO, DSO, and DPO and their interactions with Firm Size. Future studies could also compare alternative panel estimators and robustness procedures to further assess the stability of the relationships identified in this study.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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