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The Impact of Working Capital Management on Investment Efficiency: Evidence from Emerging Countries

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Abstract

This article aims to investigate the impact of the firm's working capital management policies and practices on the efficiency of their investments. The sample consists of 6016 non-financial firms and the data have been collected for the period from 2009 to 2021. We conducted pooled ordinary least squares (OLS) regression, and panel regression and employed the generalized method of moments to explore the dynamic nature of the relationship. The results revealed that, in static models, pooled OLS regression showed a positive relationship between CCC and investment efficiency, whereas panel regression reported a negative relationship. A similar case is confirmed by the dynamic models. The non-linear models which include the square of CCC confirmed an inverted U-shape relationship, implying an optimal level of CCC. The findings of the study are expected to have implications for corporate managers, the users of financial statements, as well as policymakers and regulatory bodies. To the best of our knowledge, this is the first empirical study investigating the impact of working capital on investment efficiency. It makes an original contribution to the literature by presenting novel empirical evidence on the topic from emerging countries in a multi-country and multi-industry context.

Keywords: *Working capital management, investment efficiency, emerging countries.*

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1. Introduction

Working capital management which involves the management of a firm's current accounts has its own challenges for corporate managers, however, it is not completely a separate and independent task and is expected to have effects and implications on long-term financial decisions as well as on firm value. The concept of expected future cash flows is one of the most important phenomena in the corporate finance literature and is used as the basis for several calculations and decisions such as investment appraisal and firm valuation methods. Hence, there exists a strong connection between working capital management decisions/policies and long-term investment and financing decisions, they cannot be isolated from each other and should be managed in harmony with a holistic approach. Firms face trade-offs when deciding about the level of working capital accounts and they search for the optimal levels which will help firm value maximization as well as developing and maintaining good relationships with the stakeholders, specifically customers and suppliers. Efficient management of working capital basically refers to policies and decisions about the level of current assets and liabilities and aims that maturing liabilities are met on time and also non-current assets are serviced properly (Osisioma, 1997) and there is a great latitude to achieve an improved level of efficient working capital management (Ek & Guerin, 2011). A significant strand of literature has worked on the impact of working capital management on firm profitability and reported mixed results; some studies found a positive impact while others reported a negative impact, and even some recent studies reported that there is an inverted U-shape relationship between working capital management and the firm profitability. (Baños-Caballero et al., 2012; Altaf & Shah, 2018; Yilmaz & Nobanee, 2023). Another strand of literature focused on the impact of working capital management on firm value. However, the impact of working capital management on the efficiency of firm investment has not been studied. Both profitability and firm value are, in the long term, dependent on a firm's investment efficiency.

This article aims to investigate the nature of the relationship between a firm's working capital management and its investment efficiency. We use cash conversion cycle (CCC), a commonly used measure of working capital management as the proxy of working capital management and it is composed of days receivables outstanding, inventory holding period, and payable deferral period. As the proxy of investment efficiency, we use the absolute residuals obtained from the investment model by following Biddle et al. (2009). Firms are supposed to achieve the optimal level of investment to maximize firm value, however, due to several factors including corporate governance issues such as adverse selection, moral hazard, or managerial opportunism, and also the factors related to financial management such as financial distress or liquidity problems, they deviate from that level and face under- or over-investment problems. We hypothesize that a firm having liquidity problems due to unsuccessful management of working capital accounts may have to postpone some positive net present value (NPV) projects or vice versa. Therefore, WCM is expected

to have a significant influence on investment efficiency. We use a sample of firms from emerging countries because emerging countries differ from developed countries in several aspects such as the level of economic development, money, and capital markets, and legal systems, among others. The firms in emerging countries face financial constraints, which are affected by several country-specific and firm-specific factors (Nizaeva & Coskun, 2021). The differences in those aspects may affect the excess of firms to sources of finance and make WCM more crucial for them.

This article contributes to the existing literature in several ways. The first, to the best of our knowledge, it is the first study that focuses on the impact of working capital practices on investment efficiency. Secondly, it uses a large sample of non-financial firms from several emerging countries for a relatively long period and also reports the results in both country details and industry details. Thirdly, it conducts a comprehensive analysis covering pooled OLS, panel data regression as well as generalized method of moments.

The rest of the article is organized as follows. The second section provides a brief review of the related literature. The third section presents the details of the sample, the data, and the methodology adopted. The fourth section reports the results of the regression analyses. The last section concludes.

2. Literature Review and Hypothesis Development

The concept of investment and the efficiency of investments are of crucial importance in the corporate finance literature because the wealth maximization objective can be achieved by positive and sustainable cash flows, which are dependent on the productive capacity of the firm. The firm growth in the long run is reliant on investments (Lang et al.,1996) and strategic investment decisions significantly affect the firm performance in the long run (Northcott & Alkaraan, 2007; Alkaraan, 2020). Under perfect market conditions, it has been assumed that the investment decisions are the function of available investment opportunities (Modigliani & Miller, 1958; Tobin,1969), however, in real-world conditions, the investment decisions are affected by several internal and external factors. If a firm invests the funds into the projects with the highest positive NPV projects available, it is theoretically assumed to have maximum return on investment, resulting in investment efficiency (IE). More specifically if the firm succeeds in avoiding the cases of over-investment in which it invests in projects with negative NPV and under-investment in which it fails to invest in projects with positive NPV, IE is achieved (Verdi,2006; Biddle et al.,2009; Lei et al., 2014). Market frictions such as information asymmetries between insiders and outsiders and also agency costs may cause inefficient or suboptimal investments (Jensen,1986; Myers & Majluf, 1984; Lambert et al., 2007).

There has been a substantial body of literature investigating the factors that may potentially affect the efficiency of investments such as financial reporting quality

(Biddle et al., 2009; Chen et al., 2011, Tahat et al., 2022), accounting conservatism (Lara et al., 2016), corporate social responsibility (Benlemlih & Bitar, 2018; Cook et al., 2019, Afrin & Rahman, 2023), environmental, social, governance (ESG) performance (Al-Hiyari et al., 2023) and ESG disclosure (Hammami & Zadeh, 2020, Ellili, 2022), corporate governance related issues (Moradi et al., 2022; Wu et al., 2023). However, the potential impact of working capital management has been ignored. Some studies examined the relationship between financial constraints and investment efficiency, and most of those studies used several proxies of financial constraints such as firm size, dividend payout, and listing status, among others. Although theoretically, this line of research is close to the impact of WCM on investment efficiency, in other words, both aim to find out how investment efficiency might be affected by the availability of funds, those proxies for financial constraints do not reflect the explicit impact of managing current accounts of the firm. WCM has crucial importance from several aspects as documented in the literature such as affecting profitability (Braimah et al., 2021; Aldubhani et al., 2022, among others), has an impact on firm risk and value (Boisjoly et al., 2020, Sawarni et al., 2022).

Moreover, the effective and successful management of working capital accounts may help a firm to obtain external funds in the form of bank loans or other external finance sources because financial institutions, especially banks extend loans based on the assessment of both profitability and liquidity of the firm by examining key financial ratios. For instance, the current ratio is a commonly used measure to evaluate the ability of the firm to meet its short-term obligations. If a firm has an unsatisfactory ratio, this may cause a rejection of loan applications. Therefore, working capital management has a key role in the liquidity position of a firm and may have a significant impact on investment efficiency in the long term.

A strand of literature investigated the effect of financial flexibility on investment efficiency, the underlying assumption was that if a firm has enough financial flexibility, it may be able to take investment opportunities. Financial flexibility enables a firm to undertake investment projects with positive NPV easily, enhance the investment performance in the long term through follow-up projects, and to respond cash flow shocks (Gamba & Triantis, 2008; Marchica & Mura, 2010; De Jong et al., 2012). Financial flexibility gives strength to the firm to tackle unexpected cases in the future and contributes to the wealth maximization objective (Ma & Jin, 2016). Prior literature used several proxies for financial flexibility which can be divided into two groups as those related to leverage (Byoun, 2008; Baños-Caballero et al., 2016; Lambrinoudakis, 2019) and those related to cash holdings (Faulkender & Wang, 2006; Wu et al., 2024). Both leverage and cash holdings are financial policies that have close interrelationships with the firm's working capital policies and decisions.

Working capital may play an important role in the context of financial flexibility as a source of liquidity. Fazzari and Petersen (1993), in their seminal work, documented that working capital can be used as a smoothing mechanism for fixed investment relative to cash-low shocks for financially constraint firms; the firms with high

liquidity are expected to smooth fixed investment relative to variations in cash flows without using any costly external source of finance. Some studies examined the effect of financial flexibility on the relationship between working capital and firm performance by using the above-mentioned measures of financial flexibility. For instance, Altaf (2020) reported that financially flexible firms can finance a higher proportion of their working capital through the use of short-term debt. Harris & Li (2021) investigated the relationship between negative operating cash flows and investment inefficiency and reported a positive relationship, implying an increase in subsequent overinvestment. This finding has also implications for the role of working capital management because the firm policies for managing current accounts and decisions about trade credit affect whether firms will have negative or positive operating cash flows, though it is affected by other factors such as capital structure or tangibility.

To the best of our knowledge, the direct impact of working capital management on the firm's investment efficiency has not been studied. Based on the discussion above, we hypothesize that there is a significant relationship between working capital management and the firm's investment efficiency. We use the cash conversion cycle (CCC) as the proxy for working capital management. CCC is commonly used to measure WCM in the literature and it is the net of receivables collection period, inventory holding period, and payable deferral period. We assume that a shorter CCC will provide the firm a greater liquidity and will help improve its investment efficiency. Therefore, we can write the first hypothesis as follows:

H1: There is a significantly negative relationship between CCC and investment efficiency.

Extensive literature has searched for the impact of CCC on the firm profitability and reported mixed results, however, recent studies reported an inverted-U shape relationship, implying an optimal level of CCC. Following this strand of prior studies, we also hypothesize that there is an optimal level of CCC for its impact on investment efficiency. Thus, the second hypothesis can be expressed as follows:

H2: There is an inverted-U-shaped relationship between CCC and investment efficiency, implying an optimal CCC.

3. Research Design and Methodology

3.1. Sample and Data

Details of the sample in industry and country breakdown are shown in Table 1. The sample is composed of 9 industries from 14 emerging countries and includes 6016 non-financial firms. Banks and other financial firms are excluded from the sample due to their operating characteristics and the different financial statement formats. The firms with missing data are also eliminated from the sample. As a result, we have strongly balanced panel data with 78208 firm-year observations (6016 firms and 13

years from 2009 to 2021). The data were extracted from the LSEG Workspace database (previously Refinitiv Eikon).

Table 1. Industry and Country breakdown of the sample

	BM	CC	CNC	EN	HC	IND	RE	TECH	UT	Total
Brazil	23	30	23	5	5	31	18	4	26	165
China	361	331	153	80	172	471	106	276	68	2,018
Egypt	16	18	14	2	6	12	5	1	1	75
India	291	316	89	27	80	206	26	91	22	1,148
Indonesia	47	50	44	21	10	29	25	10	2	238
Mexico	17	19	18	-	2	10	1	2	-	69
Nigeria	1	2	11	3	2	4	1	-	1	25
Pakistan	39	48	27	13	7	8	1	3	5	151
Philippines	8	14	16	8	1	9	21	6	11	94
Russia	43	14	11	29	6	66	2	9	64	244
S. Africa	24	22	17	2	4	15	11	15	-	110
S. Korea	198	232	84	22	106	251	3	294	11	1,201
Turkey	41	51	25	4	2	24	12	12	4	175
Vietnam	58	43	41	27	11	82	16	11	14	303
Total	1,167	1,190	573	243	414	1,218	248	734	229	6,016

Notes: BM: Basic Materials, CC: Consumer Cyclicals, CNC: Consumer Non-cyclicals, EN: Energy, HC: Healthcare. IND: Industrials, RE: Real Estate, TECH: Technology, UT: Utilities

3.2. Variable Measurement

The details about the variables used in the models are in Table 2. The dependent variable is the investment efficiency, and it is calculated as the absolute residual of the investment model (Biddle et al., 2009) multiplied by -1.

Table 2. Variable Measurement

Variable	Label	Measurement
Investment Efficiency	IE	The residuals of the investment model *(-1)
Cash Conversion Cycle	CCC	Receivable days +Inventory days- Payable days
Square of CCC	CCC^2	CCC squared
Firm Size	FS	Natural logarithm of total assets
Firm Age	FA	No of years since the establishment
Financial Leverage	FL	Total Liabilities/Total Assets
Tangibility	TANG	Tangible fixed assets/Total Assets
Profitability	PROF	Net Profit after Taxes/Total Assets
Financial Slack	FSLACK	Cash and short-term investments/Total Assets
Market-to-Book Value	MVBV	Share price*No of shares/Book value of Equity
Operating Cash Flow	OCFTA	Operating cash flow/Total Assets
Dividends	DIV	Dummy if 1, dividends paid, 0 otherwise
GDP Growth Rate	GDPGR	Annual growth rate of GDP in each country
Inflation	INF	Annual inflation rate in each country
Investment	INV	Net investments
Sales Growth	SG	Change in sales year over year

The residuals are the deviations from the optimal investment level calculated by running cross-sectional regressions of the prior year's sales growth over the total investment as per industry. The error term of the regressions run corresponds to the deviations from the estimated level of investment. The higher value implies higher investment efficiency.

$$INV_{i,t} = \alpha_{i,t} + \beta_1 SG_{i,t-1} + \varepsilon_{i,t}$$

Investment (INV) is the net of tangible and intangible non-current asset acquisitions and the proceeds from the sales of those assets. Sales growth (SG) is the change in sales in the prior year compared to the year before.

3.3. Methodology and Empirical Models

Based on the hypotheses developed in the literature review section, we write the following models. Models 1 and 2 are static models. Models 3 and 4 are dynamic models in which the first lag of the dependent variable is included as an explanatory variable.

$$IE_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 FS_{i,t} + \beta_3 FA_{i,t} + \beta_4 FL_{i,t} + \beta_5 TANG_{i,t} + \beta_6 PROF_{i,t} + \beta_7 FSLACK_{i,t} + \beta_8 MVBV_{i,t} + \beta_9 OCFTA_{i,t} + \beta_{10} DIV_{i,t} + \beta_{11} GDPGR_{i,t} + \beta_{12} INF_{i,t} + \beta_{13} COUNDUM_j + \beta_{14} INDDUM_k + \beta_{15} YEARDUM_l + \varepsilon_{i,t} \quad \text{(Model 1)}$$

$$IE_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 CCC^2{}_{i,t} + \beta_3 FS_{i,t} + \beta_4 FA_{i,t} + \beta_5 FL_{i,t} + \beta_6 TANG_{i,t} + \beta_7 PROF_{i,t} + \beta_8 FSLACK_{i,t} + \beta_9 MVBV_{i,t} + \beta_{10} OCFTA_{i,t} + \beta_{11} DIV_{i,t} + \beta_{12} GDPGR_{i,t} + \beta_{13} INF_{i,t} + \beta_{14} COUNDUM_j + \beta_{15} INDDUM_k + \beta_{16} YEARDUM_l + \varepsilon_{i,t} \quad \text{(Model 2)}$$

$$IE_{i,t} = \beta_0 + \beta_1 IE_{i,t-1} + \beta_2 CCC_{i,t} + \beta_3 FS_{i,t} + \beta_4 FA_{i,t} + \beta_5 FL_{i,t} + \beta_6 TANG_{i,t} + \beta_7 PROF_{i,t} + \beta_8 FSLACK_{i,t} + \beta_9 MVBV_{i,t} + \beta_{10} OCFTA_{i,t} + \beta_{11} DIV_{i,t} + \beta_{12} GDPGR_{i,t} + \beta_{13} INF_{i,t} + \beta_{14} COUNDUM_j + \beta_{15} INDDUM_k + \beta_{16} YEARDUM_l + \varepsilon_{i,t} \quad \text{(Model 3)}$$

$$IE_{i,t} = \beta_0 + \beta_1 IE_{i,t-1} + \beta_2 CCC_{i,t} + \beta_3 CCC^2{}_{i,t} + \beta_4 FS_{i,t} + \beta_5 FA_{i,t} + \beta_6 FL_{i,t} + \beta_7 TANG_{i,t} + \beta_8 PROF_{i,t} + \beta_9 FSLACK_{i,t} + \beta_{10} MVBV_{i,t} + \beta_{11} OCFTA_{i,t} + \beta_{12} DIV_{i,t} + \beta_{13} GDPGR_{i,t} + \beta_{14} INF_{i,t} + \beta_{15} COUNDUM_j + \beta_{16} INDDUM_k + \beta_{17} YEARDUM_l + \varepsilon_{i,t} \quad \text{(Model 4)}$$

3.4. Estimation Method

To test the first hypothesis, we run pooled ordinary least squares (OLS) regressions and panel regressions by using model 1 and the generalized method of moments (GMM) regression by using model 3. To test the second hypothesis, we run pooled OLS and panel regressions by using model 2 and GMM regression by using model 4. Panel regressions were run as fixed effects and random effects models and the Hausman (1978) specification test was used to decide about the appropriate model. To adjust for potential heteroscedasticity and serial-correlation problems, we used

adjusted standard errors. GMM regressions were for the dynamic models in which the first lag of the dependent variable is added as an independent variable into the models. More specifically, we employed a two-step GMM estimator, which allows controlling for endogeneity through instrumental variables (Arellano & Bover, 1995; Blundell & Bond, 2000). This estimator is especially suitable for datasets with small T (time periods) and large N (firms), which is the case of our dataset. In dynamic models, the right-hand side variables are considered endogenous variables, and their second to third lags as instruments for the equations in differences, and the lagged first-differenced endogenous independent variables as instruments for the level equations. We also included dummies for industry, country, and year effects. For the model specification and validity, we employed two tests, the first is the Hansen statistic, which confirms the lack of correlation between the instruments and the error term and also the validity of the instruments and whether the models suffer from over-identification problems. The second is AR statistic which confirms the lack of second-order serial correlation in the residuals.

4. Results and Findings

4.1. Descriptive Statistics

The descriptive statistics for all variables, namely mean, standard deviations, and minimum and maximum values are reported in Table 3.

Table 3. Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
IE	78208	-.237	8.623	-153.397	188.117
CCC	78208	166.204	324.852	-3801.375	4912.877
FS	78208	19.426	1.907	11.664	26.736
FA	78208	28.235	18.101	11	158
LEV	78208	.234	.184	0	.988
TANG	78208	.309	.208	0	.996
PROF	78208	.035	.11	-2.18	2.707
FSLACK	78208	.148	.143	-.036	1
OCFTA	78208	.058	.102	-2.696	3.302
MVBV	78208	3.912	39.93	-2233.869	4247.834
DIV	78208	.609	.488	0	1
INF	78208	4.206	3.516	-.728	29.507
GDPGR	78208	5.191	3.373	-9.518	11.439

Investment efficiency has a mean of 23.7% with a standard deviation of 8.6, the value is negative due to the calculation procedure, and absolute values of residuals are multiplied by -1. This mean value of investment efficiency is consistent with the prior studies and implies a moderate level of investment efficiency. CCC has a mean of 166 days, ranging from a negative of 3801 days to a maximum of 4912 days. An average of 166 days CCC for non-financial firms is a moderately acceptable level. Firm age has

a mean of 28 years, implying that firms in the sample are relatively young. Leverage and tangibility reveal similar patterns, some firms have no leverage whereas others are highly leveraged, and some firms do not own tangible non-current assets while others have more asset-intensive balance sheets. The mean value of PROF is 3.5%, even though it has a wide variability among the firms. Cash and cash equivalents represent 14.8% of total assets on average for the sample firms. Operating cash flows represent 5.8% of total assets. MVBV has a mean of 3.9, implying that the firms are valued positively by the markets on average. Dividend is a dummy variable taking the value of 1 if the firm pays dividends, and 0 otherwise. The mean value of 0.6 implies that the majority of the firms pay dividends. Macroeconomic variables, inflation, and GDP growth rate have mean values of 4.2% and 5.2% respectively.

4.2. Correlation Matrix

Table 4 reports the results of pairwise correlations. The correlation between investment efficiency and the cash conversion cycle is negative, implying that a shorter CCC will enhance investment efficiency. There are no high correlations among the independent variables, more specifically the coefficients are not greater than 0.5, therefore the estimates do not suffer from multicollinearity problems. Pairwise correlations between investment efficiency and all independent variables are significant.

4.3. Regression Results and Empirical Analysis

In this section, we report the results of the regressions which were run as per the models specified in the previous section. Table 5 presents the results of the static models which were run as per the pooled OLS and panel regressions. Model 1 employs CCC as the independent variable and other control variables, whereas Model 2 also employs the square of CCC. The results of Model 1 show that according to pooled OLS, there is a positively significant impact of CCC on firm investment efficiency, implying that longer CCC helps improve investment efficiency. However, fixed effects and random effects regressions show that the impact of CCC on investment efficiency is negatively significant. Hausman test result suggests that the fixed effects model is more suitable. Regarding the control variables included in the models, firm size is found to have a positive effect, implying that larger firms have higher investment efficiency. Pooled OLS and fixed effects reported negative coefficients for firm age. Leverage has a positive effect, which implies that higher leverage helps enhance firm investment efficiency, the use of external financing brings tax advantages in many countries and also helps firms with inadequate internal funds to undertake potential projects through the use of bank loans or other financing arrangements. Tangibility has a positive coefficient, and this shows that the firms with a more tangible asset-intensive balance sheet have higher investment efficiency, this is partly an industry-related aspect because asset structure might change from one industry to the other.

Table 4. Pairwise Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) IE	1												
(2) CCC	-0.049***	1											
(3) FS	0.078***	0.041***	1										
(4) FA	-0.044***	-0.044***	0.022***	1									
(5) LEV	0.071***	0.015***	0.207***	0.011***	1								
(6) TANG	0.207***	-0.226***	0.034***	0.087***	0.284***	1							
(7) PROF	0.075***	-0.077***	0.052***	0.004	-0.250***	-0.050***	1						
(8) FSLACK	-0.045***	-0.060***	0.009***	-0.142***	-0.408***	-0.381***	0.168***	1					
(9) OCFTA	0.127***	-0.140***	0.050***	0.031***	-0.142***	0.149***	0.365***	0.126***	1				
(10) MVBV	0.016***	0.003	-0.029***	-0.004***	0.003	-0.004	0.009	-0.001	0.009***	1			
(11) DIV	0.073***	-0.041***	0.236***	0.060***	-0.173***	-0.044***	0.318***	0.142***	0.210***	-0.008***	1		
(12) INF	-0.010***	-0.041***	-0.244***	0.121***	0.045***	0.095***	0.096***	-0.187***	0.069***	0.019***	-0.013***	1	
(13) GDPGR	0.038***	0.047***	0.036***	-0.226***	0.002	-0.055***	0.066***	0.094***	-0.033***	0.016***	0.061***	-0.064***	1

Table 5. Pooled OLS and Panel Regression Results - Static Models

	Model 1			Model 2		
	Pooled OLS	FE	RE	Pooled OLS	FE	RE
CCC	0.181*	-0.604**	-0.629***	-0.32**	-1.43***	-1.277***
	(1.88)	(-2.44)	(-5.28)	(-2.14)	(-4.70)	(-7.33)
CCC²	-	-	-			
FS	0.182***	1.105***	0.303***	0.181***	1.115***	0.303***
	(10.45)	(8.74)	(11.00)	(10.43)	(8.81)	(10.99)
FA	-0.027***	-0.014	-0.041***	-0.027***	-0.015	-0.041***
	(-15.96)	(-0.86)	(-13.82)	(-15.98)	(-0.9)	(-13.8)
LEV	1.959***	1.803***	1.940***	1.961***	1.805***	1.944***
	(10.2)	(3.40)	(8.48)	(10.21)	(3.41)	(8.49)
TANG	8.301***	13.788***	11.332***	8.252***	13.73***	11.268***
	(49.91)	(20.99)	(51.58)	(49.51)	(20.93)	(51.21)
PROF	3.874***	4.485***	4.519***	3.851***	4.411***	4.48***
	(12.47)	(5.44)	(14.58)	(12.4)	(5.37)	(14.43)
FSLACK	0.514**	1.864***	0.824***	0.46*	1.801***	0.753***
	(2.05)	(3.66)	(2.87)	(1.83)	(3.55)	(2.62)
OCFTA	6.557***	2.593***	4.339***	6.526***	2.600***	4.329***
	(20.01)	(3.08)	(13.25)	(19.91)	(3.09)	(13.22)
MVBV	0.004***	0.003*	0.003***	0.004***	0.003*	0.003***
	(4.8)	(1.80)	(4.24)	(4.81)	(1.84)	(4.26)
DIV	0.845***	0.715***	0.830***	0.849***	0.709***	0.829***
	(12.49)	(6.58)	(11.03)	(12.55)	(6.53)	(11.02)
INF	-0.05***	0.064**	0.065***	-0.051***	0.065**	0.065***
	(-5.46)	(3.97)	(4.66)	(-5.62)	(3.98)	(4.66)
GDPGR	0.073***	0.146***	0.128***	0.074***	0.146***	0.128***
	(7.98)	(9.0)	(7.59)	(8.09)	(8.97)	(7.57)
Constant	-7.339***	-27.865***	-15.865***	-7.257***	-27.9***	-15.78***
	(-21.32)	(-12.12)	(-27.41)	(-21.05)	(-12.2)	(-27.2)
Industry dummy	No	Yes	Yes	No	Yes	Yes
Country dummy	No	Yes	Yes	No	Yes	Yes
Time-fixed effect	No	Yes	Yes	No	Yes	Yes
Observations	78,208	78,208	78,208	78,208	78,208	78,208
R2 (%)	6.8	4.3	4.1	6.8	4.4	6.6
F Stat (P>F)	476.01***	44.74***	-	440.96***	43.31***	-
Wald test	-	-	5869.25***	-	-	5895.89***
Hausman test	-	624.37***			628.31***	

Profitability also has a positive effect; more profitable firms can accumulate reserves which enable them to undertake potential investment opportunities. Two control variables referring to the liquidity level of the firm, namely financial slack and operating cash flow scaled by total assets have positive effects, implying that better liquidity conditions improve the firm's investment efficiency. Market-to-book value ratio has also a positive coefficient, implying that the stock market performance of the firm has a positive impact on investment efficiency. Macroeconomic variables,

inflation, and GDP growth rate have positive coefficients under fixed effects models, but inflation has a negative coefficient under the pooled OLS model. A positive GDP growth and a better economic environment at the country level may help firms have a higher investment efficiency.

The results of Model 2 show that CCC has a negatively significant impact on firm investment efficiency according to pooled OLS and panel regressions. The sign of CCC2 is positive, as expected, and this confirms the existence of an optimal level CCC at which investment efficiency has a peak point. In other words, the relationship between CCC and investment efficiency is positive till the optimal level, but beyond that, it turns into a negative relationship. Therefore, there is an inverted U-shaped relationship between CCC and firm investment efficiency. The result of the Hausman test suggests that fixed effects should be preferred. Wald test confirms the overall model significances for pooled OLS and panel regressions. The coefficients of the control variables are similar to those in Model 1.

Table 6 reports the results of dynamic panel regressions, model 3 and model 4, in which the lag of the dependent variable is included as an independent variable in the regressions. The result of the Wald test shows that both models have overall significance at a 1% level. In both models, the lag of investment efficiency has a positive effect on the current period's investment efficiency, implying that higher efficiency in investments in the previous financial year affect positively the efficiency in the following year. In Model 3, CCC has a significantly negative effect on investment efficiency, implying that a shorter CCC is associated with higher levels of investment efficiency. In the non-linear model, Model 4, the coefficient of CCC is confirmed and the coefficient of CCC2 is positive, this result shows that there is an inverted U-shape relationship between CCC and investment efficiency, pointing out an optimal level of CCC. The result found in model 2 and this finding indicates an inflection point, the peak of the inverted U shape, this is the point at which the positive impact of CCC on investment efficiency ceases and begins to have a negative impact. This inflection point is obtained by differentiating the investment efficiency variable (IE) concerning the working capital management variable (CCC) and getting the calculated derivative equal to zero.

As a result, the inflection point is obtained by the expression of $-\beta 1/2\beta 2$ (Fernandes et al., 2021). According to the coefficients in Model 4, it can be calculated as -1.55/2*0.407 and results in 190 days. This length of CCC is greater compared to those calculated according to the coefficients in Model 2 pooled OLS result, which is 64 days (-0.32/2*0.25) in pooled OLS, however, slightly shorter compared to the coefficients in Model 2 fixed effects result, which is 204 days (-1.42/2*0.348). The lengths of the optimal CCC period suggested by the GMM model and fixed effect model are close to the durations found in the studies that searched for the optimal CCC in the context of the working capital management- profitability relationship. For instance, in a recent study, Yilmaz and Nobanee (2023) reported 255 days of CCC for large multi-country and multi-industry samples.

Table 6. GMM Regression Results – Dynamic Models

	Model 3	Model 4
Lag of IE	0.226*** (66.27)	0.224*** (65.86)
CCC	-0.642*** (-3.4)	-1.55*** (-5.84)
CCC^2	-	0.407*** (5.02)
FS	6.072*** (42.31)	5.832*** (41.21)
FA	-0.177*** (-12.6)	-0.146*** (-10.7)
LEV	6.642*** (11.97)	6.7*** (12.13)
TANG	23.249*** (36.7)	23.041*** (36.5)
PROF	0.406 (0.87)	0.534 (1.15)
FSLACK	-4.652*** (-7.9)	-4.558*** (-7.77)
OCFTA	5.295*** (11.98)	5.143*** (11.66)
MVBV	0.003*** (2.96)	0.004*** (3.29)
DIV	0.036 (0.28)	0.015 (0.12)
INF	0.254*** (12.4)	0.243*** (12.04)
GDPGR	0.08*** (5.98)	0.083*** (6.18)
Constant	-123.049*** (-46.42)	-119.087*** (-45.53)
Industry dummy	Yes	Yes
Country dummy	Yes	Yes
Observations	72192	72192
Wald test (P>F)	8440.78***	8324.02***
AR(1) p value	0.000***	0.000***
AR(2) p value	0.6192	0.7625
Hansen test	0.261	0.312

The coefficients of the control variables are mostly similar to those in Models 2 and 3, with some exceptions, for instance, financial slack has a significantly negative effect, implying that keeping lower levels of cash and cash equivalents is associated with higher investment efficiency. Profitability and dividend payout were found to be insignificant in dynamic models. The results of AR(1) and AR(2) tests of GMM confirm the existence of first-order autocorrelation and the absence of second-order

autocorrelation, respectively. The result of the Hansen test is not significant, confirming that the instruments used in the models are valid.

5. Conclusion

This article aimed to investigate the impact of working capital management which is proxied by CCC on the firm-level investment efficiency for a large sample of non-financial firms from several emerging countries for a relatively long period of 2009-2021. We tested two hypotheses about the relationship, first, whether the relationship is linear, and second, whether the relationship is non-linear. For this purpose, we developed four models, the first two models tested the hypotheses by using static regressions, and the other two models tested the hypotheses by using dynamic models, in which the lag of the dependent variable has been included as an independent variable. The results revealed that linear models suggest that there is an inverse relationship between CCC and investment efficiency, implying that a shorter CCC is expected to improve the efficiency of firm investment or vice versa. A shorter CCC depicts that the firm has short periods of receivable collection and inventory holding and long periods of payable deferral, by taking advantage of trade credits from suppliers and also points to a better liquidity level for the firm. The results of non-linear models show that there is an inverted U-shape relationship between CCC and investment efficiency, implying that there is an optimal level of CCC. Therefore, the results of non-linear models imply that the objective of the firms should not minimize CCC as much as possible, rather they can target an optimal duration of CCC, by extending trade credits to the customers and also by taking advantage of deferrals from the suppliers. The inverted U-shape relationship points out that the duration of CCC has a positive impact on investment efficiency up to a specific point, however, it turns out to have a negative impact beyond that point.

The findings of this study will have important implications for corporate managers and also for policymakers and lending institutions. The managers may benefit from the findings in designing short-term financial management policies, specifically relating to working capital accounts, by considering their impact on long-term decisions such as investment efficiency. Short and long-term policies should be crafted and implemented in harmony with each other. The lending institutions, especially banks, may use the findings in credit extension decisions, because CCC may play a signalling role in evaluating investment efficiency.

The study has some limitations, which might inspire the directions for future research. Although it employed a relatively large sample, the size of the sample can be increased by enlarging the country coverage. Similarly, the period can be extended, and both of these improvements might produce more comprehensive and robust results. We used CCC as the proxy for working capital management and it is the most commonly used measure in this line of research. Future studies may consider using alternative proxies for CCC and investigate their impacts on investment efficiency. Another strand of future research may focus on moderating

and mediating factors that might potentially affect the relationship between CCC and investment efficiency. These factors include corporate governance attributes, for instance, board size and independence, board gender diversity, as well as some financial attributes, for instance, the relationship with lending institutions.

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