JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

FINANCING THE OPERATING CYCLE: CORPORATE LEVERAGE ACROSS FIRM LIFE CYCLES AND FINANCIAL SYSTEMS

Tayyab Mushtaq[1], Muhammad Ashraf[2], Ahmad Ghazali*[3]

*[1]Department of Management & Administrative Sciences, University of Narowal, Narowal, Pakistan
[2]Department of Management & Administrative Sciences, University of Narowal, Narowal, Pakistan
[3]Department of Management Sciences, University of Gujrat, Gujrat, Pakistan

[1]tayyab.mushtaq@live.com, [2]ashraf.iub@gmail.com/ muhammad.ashraf@uon.edu.pk,
*[3]ahmad.ghazali@uog.edu.pk

DOI: https://doi.org/10.5281/zenodo.23498213

Keywords
Cash conversion cycle; Corporate leverage; Firm life cycle; Working capital management; Economic setting

Article History
Received: 13 July 2026
Accepted: 04 October 2026
Published: 20 October 2026

Copyright @Author
Corresponding Author: * Ahmad Ghazali

Abstract
This study investigates the relationship between the cash conversion cycle and firm leverage during the firm's life cycle in different economic settings. The panel includes 134 economies with 330,575 firm-year observations for the period 2000–2025. The quadratic regressions suggest a U-shaped benchmark relationship, with minimum estimated leverage at approximately 184 days. The profiles of Mature and Decline firms show minima around 200 days, while the aggregate Growth model does not identify a statistically supported minimum. Advanced economies have an upward-curving relationship, while emerging market and developing economies have a downward-curving relationship. Industry and year effects and lagged regressors preserve the benchmark pattern, while firm fixed effects and alternative estimators provide less consistent support. The results indicate that operating-cycle assessments should take into consideration the development of the firm and the economic environment.

1. Introduction
Companies invest money in their inventories and customers' credit before they get cash from customers for their sales. The financing impact will depend on the extent of supplier financing, the speed of cash generation of operating assets and the willingness of lenders to lend. Research also links corporate culture to supplier finance and business-process digitalization to working-capital outcomes, connecting operating and financing decisions with internal firm attributes (Wali Ullah et al., 2025; D. Wang & Nie, 2025). New research links working capital balances and efficiency to financial leverage, with different relationships for short-term and long-term borrowing (Flannery & Öztekin, 2024; Mansour, 2025). These results introduce a choice made by companies in their day-to-day operations to capital structure research: what is the relationship between the length of the cash conversion cycle and financial debt, and when does it shift?

The cash conversion cycle (CCC) is inventory days plus receivables days minus payables days. It reflects the period of net operating funds, not the gross operating cycle. An increase can be due to either higher investment in operations or slower collections or adjustment of financing with suppliers. Recent research has revealed that these adjustments occur when the supply chains or banking conditions are uncertain, but it varies by the source of uncertainty (J. Huynh, 2024; N. Huynh & Le, 2025). AI investment, cultural aspects, and renewable energy usage (H. Cui et

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

al., 2026; Wali Ullah et al., 2025; Zaman et al., 2025) are also related to the availability of supplier-credit. So, assuming that each long cycle is inefficient or each short cycle is a sign of financial well-being is to miss the point of the observed balance.

A lot of the working capital literature deals with performance. In the BRICS sample as well as in the wider international sample, evidence suggests that CCCs are negatively correlated with profitability (Johan et al., 2024; Kiymaz et al., 2024). Other studies find an inverted U, where working-capital investment initially supports profitability, but its costs become more important as operating commitments increase (Dash et al., 2023; Silva & Silva, 2026). Financial constraints are relevant because they can limit firms' ability to fund further operating investment. These results provide motivation to consider nonlinear specifications, but a profitability maximum does not imply a leverage minimum. Profitability and financial debt are not the same thing, and the mix of financing could shift, but the operating return remain unchanged.

Research on financial policy provides a more direct basis. Working-capital components have different relationships with debt, and the maturity of working-capital financing is also relevant to risk (Flannery & Öztekin, 2024; Ortega-Gomariz et al., 2026a, 2026b). The question is then not just "does working capital matter for borrowing?" It is whether leverage takes a nonlinear profile throughout the operating cycle, and if so, whether this operating cycle profile is similar for firms and countries. A combined analysis of total debt and its maturity structure can differentiate an overall association from movement of debt from one source to another.

There are two sources of heterogeneity that are particularly relevant. First, borrowing conditions vary across the life stages of firms: bank-loan and public-bond evidence shows less favorable borrowing conditions at the Introduction and Decline stages (Amin et al., 2023; Cai et al., 2024). Age-based evidence from European SMEs also shows that the debt relationship depends on financial development and crisis conditions (La Rocca et al., 2025). Second, cash cycles and the balance between supplier financing and financial debt are linked to country conditions (Chang et al., 2025; González, 2025). Within China, studies of law enforcement and bankruptcy courts link the legal environment to firms' adjustment towards target capital structures (Y. Cui & Zhang, 2025; Su & Zheng, 2025). These results indicate that financing relationships can depend on both corporate development and the credit setting.

A cross-country comparison is particularly helpful here, because a financing requirement can be satisfied with different combinations of retained funds, supplier credit and borrowing. These possibilities need to be distinguished in measurement. Our dependent variable is financial debt relative to assets, while payables enter the operating-cycle measure itself.

These relationships are analyzed using 330,575 firm-year observations for 134 economies from 2000 to 2025, with 325,139 observations in the benchmark regression. Quadratic specifications evaluate the form of the CCC–leverage relationship. Heterogeneity is analyzed through debt-maturity splits, component decompositions, life-cycle stages, economic groups and joint comparisons. A vertex is considered a leverage minimum only when convex curvature is statistically supported and its position falls within the retained cycle range. An algebraic turning point is therefore not automatically treated as an economically meaningful financing threshold.

The benchmark estimate places the minimum at about 184 days, with a 95% confidence interval of about 157 to 211 days. The industry-and-year specification gives a similar minimum near 194 days, while firm fixed effects do not establish statistically supported aggregate curvature. The relationship also varies across subgroups. Mature and Decline firms have supported convex profiles, but a convex minimum is not identified in the aggregate Growth model. The advanced-economy profile is U-shaped and the aggregate emerging-market and developing-economy profile is concave. In the joint Growth-stage comparison, the EMDE vertex is around 113 days compared with 163 days for AEs, a

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

difference of −50.3 days (p = 0.0076). The EMDE Mature and Decline vertices are statistically imprecise and outside the retained range. Lagged specifications preserve the benchmark pattern, but IV and dynamic estimates do not consistently reproduce its curvature.

The study is important as it examines the operating-cycle relationship and its shape in terms of financial debt, while previous studies have investigated the operating-cycle relationship and its link to financing decisions (Flannery & Öztekin, 2024; Mansour, 2025). It also allows for the incorporation of firm life-cycle stages and economic settings in the same comparison, expanding on the questions raised by the work on life-cycle financing and country conditions (Xin et al., 2023; González, 2025). The contribution is thus a conditional account of leverage profiles, rather than a claim that one cycle length is appropriate for all firms. Pooled estimates do not indicate the way an individual company's leverage might change as a result of changing their cycle, nor is a lower debt ratio necessarily a better operating result. Background and hypotheses are developed in Section 2. The rest consists of the research design, empirical results, sensitivity checks and implications.

2. Background

Working capital decisions involve operating investment and funding decisions. In the information-asymmetry framework, firms might choose to rely on their own resources and seek external finance if they need more than their own resources (Myers & Majluf, 1984). Supplier credit represents a unique source of financing as suppliers may have information and recovery benefits over financial lenders (Petersen & Rajan, 1997). These mechanisms suggest that the investments in operations do not have to be mirrored proportionately in financial debt. However, recent evidence from Portuguese SMEs and international private firms also suggests that supplier financing is a component of financing, with its relative importance being dependent on financing conditions and institutional characteristics (Pinto et al., 2023; González, 2025).

Supplier financing depends on the circumstances. The characteristics of trading relationships and productive assets are linked to trade credit, but these are different dimensions. Benguria et al. (2026) find that longer trading relationships are associated with greater use of trade credit, while Khoo and Cheung (2024) link older productive capital to less supplier credit. These findings caution against assuming that supplier financing is equally available to all firms. Other evidence connects trade credit with corporate growth and business strategy, with relationships that vary across financing conditions and life-cycle stages (Tingbani et al., 2024; Al-Hadi & Hussain, 2025).

New research helps to identify borrower attributes linked to access to supplier credit. H. Cui et al. (2026) find that AI investment is positively associated with trade credit; their mechanism tests point to improved operational stability and disclosure quality. Zaman et al. (2025) find a positive relationship between renewable-energy use and supplier credit among firms in 30 countries, with evidence of an environmental-risk channel. Organizational evidence comes from US companies: stronger corporate culture is associated with more supplier credit, and the relationship is stronger at higher levels of managerial ability and local social capital (Wali Ullah et al., 2025). These results suggest that payable balances reflect creditors' assessments as well as firms' operating requirements. They do not establish that the same attributes reduce financial debt, since supplier credit and financial leverage are different outcomes.

Operating benefits of working capital should be balanced with the resources that it consumes. Insufficient and excessive investments are both taken as relevant in the allocation framework in Aktas et al. (2015). Recent research also shows that working capital can benefit performance to a certain level, but once it surpasses that threshold, investments in working capital are negatively linked to profitability (Dash et al., 2023; Silva & Silva, 2026). Findings from other countries indicate that there is an inverse relationship between CCC and performance at aggregate level, with mixed findings at

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

component level (as a function of the sample and economic context) (Johan et al., 2024; Kiymaz et al., 2024; Valiña-Sotelo & Iglesias, 2026). Therefore, there is an economic significance in the difference between aggregate duration and its components.

When it comes to leverage, there are two factors to consider. Inventories and receivables are resources tied up and need financing but can also contribute to cash generation and borrowing power in future. The relationship between working capital efficiency and account composition does not mean that all the components or debt maturities are changing simultaneously, but financing decisions are related to them (Flannery & Öztekin, 2024; Mansour, 2025). The studies on working capital financing and risk also indicate the reasons for differentiating short-term funding from the total debt (Ortega-Gomariz et al., 2026a, 2026b). An examination of maturity-specific relationships, therefore, is considered along with the aggregate profile. The flexibility of contracts is another connection to debt policy. Espenlaub et al. (2025) show that loan amendments are linked to a greater speed of adjustment to the target leverage, with maturity and covenant changes in particular.

This is also important in the context of measurement. A longer payment period will decrease the CCC even if inventories and receivables are not affected. On the other hand, quicker collections can release internal funds without negotiating the terms with the suppliers. The same decrease in the length of the cycle can thus represent very different adjustments of the balance sheet. Component decompositions help identify which parts of the operating cycle are linked to leverage, while debt-maturity comparisons show whether the association appears in short-term borrowing, long-term funding or both.

More recent evidence also provides some insights into why companies have separate operating cycles. D. Wang and Nie (2025) link business process digitalisation in China to a reduction in cash cycles, mainly because of reduced days of receivables and days of inventory, while the level of evidence for the increased payables is lower. Naz et al. (2025) find a correlation between CEO gender, financial literacy and experience and working capital measures in Pakistan depending on the family ownership of the firm. These studies, combined, help in identifying the sources of variation in working capital in an operational and managerial sense. They offer background information to help in understanding the length of the cycle, but it should be tested separately in relation to financial debt.

A U-shaped prediction needs an additional condition. At relatively low operating investment, the cash-generation benefits of extending customer credit or holding inventory would need to outweigh the additional funding requirement. At longer cycles, the funding burden could become more important than those benefits. Profitability studies motivate this benefits-and-costs argument, but do not establish how it translates into a leverage minimum (Dash et al., 2023; Silva & Silva, 2026). We therefore test this relationship rather than assume that it follows from the definition of CCC.

H1. The relationship between corporate leverage and the duration of the cash conversion cycle is U-shaped, with an interior minimum where convex curvature is statistically supported.

A firm life-cycle framework helps investigate differences in funding demand and financing capacity. The cash-flow classification by Dickinson (2011) relates stages to the pattern of operating, investing and financing activity. Recent bank-loan and bond-market evidence shows stage-related differences in the cost of borrowing, including worse conditions for introduction and decline firms compared to more established firms (Amin et al., 2023; Cai et al., 2024). Additionally, the role of stage-firm characteristics such as business strategy and ESG performance in the trade credit relationship (Al-Hadi & Hussain, 2025; L. Wang & Yang, 2024) is also considered. A study of SMEs across 28 European countries based on age confirms that debt tends to decrease with age, but the relationship between the two becomes weaker during financial crises (La Rocca et al., 2025). Firm age and cash-flow stages capture different

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

aspects of corporate development. Together, this evidence motivates variation in financing profiles without imposing a universal debt ranking across stages.

Growth companies can have increased operating needs while investment requirements may also be on the rise; mature companies may have more predictable cash generation from their operations. Declining companies may still need funding while lenders become less willing to provide it. We do not impose a universal ordering of stage-specific minima, as the ordering of demands and access might differ. Within a given range of observation, there may be no obvious convex minimum at a stage.

H2. Firm life-cycle stage modifies the curvature of the CCC–leverage relationship and, where an interior minimum is identified, its position.

A second variation source is the country environment. Institutional quality is related to cash-cycle management, while legal enforcement and banking characteristics are related to trade credit and short-term financial debt (Chang et al., 2025; González, 2025). These studies examine different outcomes and do not establish a uniform effect of institutional development on borrowing. Evidence on working capital and exports, as well as studies on receivables adjustment, also suggest that financing constraints matter for the outcomes and adjustment of operating investment (Mansilla-Fernández & Milgram-Baleix, 2023; Nguyen et al., 2025). The differences can be broadly captured in the country classification, without focussing on a specific institutional mechanism. Additional evidence from China distinguishes specific financing conditions from broad economic classifications. Listed SMEs adjust their capital structures more slowly than large firms, especially during credit contractions, while stronger law enforcement narrows this adjustment-speed gap (Su & Zheng, 2025). Y. Cui and Zhang (2025) link the establishment of bankruptcy courts to smaller deviations between actual and target capital structures, with financing constraints and internal liquidity as relevant channels. H. Cui et al. (2026) also find that regional marketization strengthens the association between AI investment and supplier credit. These within-country results draw attention to the conditions under which external funds are available, but do not directly compare CCC–leverage profiles between advanced and emerging economies.

Uncertainty provides another reason to avoid assuming a common CCC threshold. Operating and banking risks are associated with changes in inventory, receivables and payables, and the responses vary depending on the disturbance in question (J. Huynh, 2024; N. Huynh & Le, 2025). But different operating and financing decisions can then result in the same measured cycle. We do not consider the distinction between advanced economies and emerging market and developing economies to be a direct indicator of credit rationing, but rather a description of different settings.

H3. The CCC–leverage relationship differs between advanced economies and emerging market and developing economies.

There can also be an interaction between life cycle and economic setting. The study on capital structure adjustment and SME debt and trade credit reveals that financing relationships are influenced by various factors such as corporate development, growth strategy, and financial conditions (La Rocca et al., 2025; Tingbani et al., 2024; Xin et al., 2023). When finances are tight, extra operating commitments could be more significant sooner for growth firms. Evidence that constraints change the profitability implications of working capital and the adjustment of receivables motivates this possibility (Silva & Silva, 2026; Nguyen et al., 2025). This literature does not directly establish a shorter CCC at minimum leverage. The hypothesis in the present study is conditional on discernible convex profiles in both groups.

H4. If both groups have convex profiles with interior minima, the leverage-minimizing CCC for growth firms in emerging market and developing economies is shorter compared to growth firms in advanced economies.

These hypotheses concern financing relationships observed in the sample. Their interpretation depends on the shape and statistical support of each fitted curve, so every algebraic vertex should not be treated as a

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

minimum. A leverage minimum is also a different outcome from a profitability maximum or a recommended operating target.

3. Research Design, Data and Variables

It relies on an unbalanced sample of publicly-listed non-financial non-utility companies from 134 economies over the period covered in the study (2000-2025). There are 330,575 firm-year observations on the source panel. The financial sector and regulated utilities are omitted from the analysis and continuous variables are winsorised at the 1st and 99th percentile. In recent years, sector exclusions and outlier treatments have also been employed in corporate-finance panels (Amin et al., 2023; Cai et al., 2024; Silva & Silva, 2026; Wali Ullah et al., 2025). The descriptive sample is split between Advanced Economies (AEs) and Emerging Market and Developing Economies (EMDEs) samples, with 185,894 and 144,681 observations, respectively. The number of regression observations differs across specifications since some controls are not available for some firm-years, and the benchmark quadratic regression includes 325,139 observations. The operating-cycle measure is limited to the observed range of support between −100 and 365 days, to allow for having fitted profiles and reporting vertices to be assessed within the range kept for the analysis.

The composition of the panels is also summarized in Table 1, for the two economic settings and five stages. Mature observations represent 45.74% of the sample, followed by Growth (24.87%), Decline (14.74%), Introduction (12.00%) and Shakeout (2.64%). AEs account for 56.23% of observations and EMDEs for 43.77%.

Table 1. Corporate life-cycle stage composition by economic setting

Corporate life-cycle stage	AEs (N)	AEs (%)	EMDEs (N)	EMDEs (%)	Full global panel N (%)
Introduction	20,539	11.05%	19,139	13.23%	39,678 (12.00%)
Growth	44,149	23.75%	38,061	26.31%	82,210 (24.87%)
Mature	88,235	47.47%	62,971	43.52%	151,206 (45.74%)
Shakeout	4,868	2.62%	3,874	2.68%	8,742 (2.64%)
Decline	28,103	15.12%	20,636	14.26%	48,739 (14.74%)
Total sample	185,894	100.00%	144,681	100.00%	330,575 (100.00%)

Note. Counts are firm-year observations. AEs = Advanced Economies; EMDEs = Emerging Market and Developing Economies. The full panel contains 330,575 observations across 134 economies.

The analysis differentiates five firm life-cycle stages, based on Dickinson's (2011) classification of cash-flow-patterns: Introduction, Growth, Mature, Shakeout and Decline. This approach classifies stages using the signs of operating, investing and financing cash flows and has also been applied in recent studies where the pricing of debt and trade credit are examined (Amin et al., 2023; Cai et al., 2024; Al-Hadi & Hussain, 2025). The country grouping separates the two groups of AEs from EMDEs, and it is utilized in separate and interacted specifications. This design enables the operating-cycle relationship to change across firm development and economic context, while neither of these classifications is used directly as a proxy for either institutional mechanism. The joint analysis is a combination of the two classifications in order to compare the estimated quadratic profiles within the observed cells.

The dependent variable is called corporate leverage and is defined as the ratio of total financial debt to total assets expressed as a percentage. The maturity analysis uses short-term and long-term financial debt, each relative to total assets and expressed as a percentage. The main explanatory variable is the cash conversion cycle (CCC), measured in days and defined as

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

days sales of inventory (DSI) + days sales outstanding (DSO) − days payables outstanding (DPO):

CCC = DSI + DSO − DPO.

This measure reflects the net time period that operating resources are bound up, taking into consideration the payment terms of suppliers. Recent working-capital studies (Kiymaz et al., 2024; Naz et al., 2025; D. Wang & Nie, 2025) utilize the definition and its three part decomposition. Days sales of inventory (DSI), days sales outstanding (DSO) and days payables outstanding (DPO) are kept separately in the component analysis. This is important since the same CCC can be obtained from different levels of inventory, customer credit and supplier credit and recent evidence indicates that the three factors can empirically vary in their relationship with financing and performance (Flannery & Öztekin, 2024; Kiymaz et al., 2024).

When comparing measures across studies, the difference between supplier finance and cycle duration also has to be taken into account. The trade credit measure of H. Cui et al. (2026) is accounts payable divided by operating costs, and Zaman et al. (2025) use the accounts payable measure divided by cost of goods sold or purchases. Payables relative to cost of goods sold or sales are also used to measure trade credit by Wali Ullah et al. (2025). These ratios measure supplier financing; the current CCC measures inventory, receivables and payables in days. Firm size, cash holdings, capital expenditures, return on assets and growth in sales are included in the control vector. Firm size is the logarithm of total assets. Cash holdings and capital expenditures are scaled to total assets; return on assets measures accounting profitability; and sales growth is the percentage change in sales over one year. These variables capture aspects usually considered in working-capital and financing models: scale, liquidity, investment, internal profitability and growth opportunities (Aktas et al., 2015; Mansour, 2025; Silva & Silva, 2026). When total debt is replaced by measures of debt-maturity, and when the sample is segmented by life cycle stage, economic setting, firm size or cash holdings, the same structure is maintained, allowing coefficient comparisons to be made on a common conditioning set.

Mean leverage is 22.668% and mean CCC is 89.780 days. The means of components were also reported in Table 2 for the decomposition.

Table 2. Descriptive statistics for the main variables

Variable	N	Mean	Std. Dev.	P25	Median	P75	Max
Total debt ratio (total debt/assets, %)	330,575	22.668	19.318	5.865	19.741	34.793	87.013
Short-term debt ratio (ST debt/assets, %)	198,537	4.785	6.482	0.886	2.648	5.885	38.898
Long-term debt ratio (LT debt/assets, %)	236,694	14.785	14.255	3.832	10.730	21.419	69.555
Cash conversion cycle (CCC, days)	330,575	89.780	82.456	32.100	76.800	133.300	365.000
Days sales of inventory (DSI, days)	330,222	84.098	70.747	32.000	67.300	115.600	337.100
Days sales outstanding (DSO, days)	330,275	70.274	52.436	34.800	59.700	92.100	283.000
Days payables outstanding (DPO, days)	330,104	65.142	50.174	31.100	52.400	84.100	278.800
Firm size (log total assets)	330,575	12.157	2.056	10.782	12.075	13.452	17.453

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Table 2. Descriptive statistics for the main variables

Variable	N	Mean	Std. Dev.	P25	Median	P75	Max
Cash holdings (cash/assets)	330,575	0.132	0.132	0.035	0.090	0.184	0.636
Capital expenditures (capex/assets)	325,323	0.048	0.052	0.013	0.031	0.064	0.271
Return on assets (ROA, %)	330,388	3.449	7.325	1.050	3.590	6.730	23.320
Revenue growth rate (%)	330,575	12.186	30.310	-2.880	7.080	21.105	152.890

Note. N varies across variables because measurement and control availability differs across firm-years. Continuous variables are winsorized at the first and ninety-ninth percentiles. Ratios are reported in the units indicated.

Pairwise correlations and variance inflation factors (VIFs) are available and are reported in Table 3. The total debt ratio is negatively correlated with CCC (correlation coefficient is −0.026), and negatively correlated with cash holdings (correlation coefficient is −0.363). The listed regressors have reported VIFs that range from 1.02 to 1.08.

Table 3. Correlations and Multicollinearity Diagnostics

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	VIF
1. Total Debt Ratio	1.000	—	—	—	—	—	—	—
2. CCC	-0.026	1.000	—	—	—	—	—	1.03
3. Firm Size	0.099	-0.121	1.000	—	—	—	—	1.05
4. Cash	-0.363	-0.039	-0.073	1.000	—	—	—	1.02
5. Capex	0.083	-0.109	0.017	-0.112	1.000	—	—	1.06
6. ROA	-0.167	-0.024	0.157	-0.005	0.146	1.000	—	1.08
7. Sales Growth	-0.009	-0.059	-0.041	0.032	0.124	0.175	1.000	1.05

Note. VIFs cover the listed linear regressors. The squared CCC term is omitted from these diagnostics, so the reported values do not establish the absence of multicollinearity in the full quadratic specification.

The benchmark specification takes into account the level and square of the CCC along with firm characteristics and year effects that are observed, and controls for these effects. The general form of the model is:

$$Leverage_{it} = \alpha + \beta_1 CCC_{it} + \beta_2 (CCC_{it}^2/1000) + \gamma' X_{it} + \lambda_t + \varepsilon_{it},$$

where $Leverage_{it}$ is the total debt ratio, X_{it} is the vector of controls, λ_t denotes year fixed effects and ε_{it} is the disturbance term. The quadratic specifications are based on the scaled term $CCC^2/1000$. Pooled OLS, year fixed effects, industry and year fixed effects and firm fixed effects are estimated, and standard errors are clustered at the firm level. Recent financing studies also use industry or time controls, firm fixed effects and firm-level clustering, with the exact specification varying across applications (Amin et al., 2023; Cai et al., 2024; Wali Ullah et al., 2025). The industry-and-year model controls for industry differences and common year shocks. The firm-fixed-effects coefficients use within-firm variation after removing time-invariant firm characteristics.

Subgroup regressions and interaction specifications examine heterogeneity. Separate models are estimated for life-cycle stages and for AEs and EMDEs. The interacted life-cycle model tests whether the CCC coefficients differ across stages, and the economic-setting interaction model tests whether the profiles differ between AEs and EMDEs. This approach allows working-

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

capital and financing relationships to vary with financial constraints, life cycle and national context (Kiymaz et al., 2024; Xin et al., 2023; Silva & Silva, 2026). The joint analysis estimates quadratic profiles for the observed life-cycle–economic-setting cells. Debt-maturity models retain the same CCC terms and controls for short-term and long-term debt, while further splits consider firm size and cash holdings. The component analysis replaces aggregate CCC with DSI, DSO and DPO and, where specified, their squared terms.

If a quadratic relation is expressed with an unscaled square term, then its vertex is at the point, $-\beta_1/(2\beta_2)$. The reported regressions scale CCC^2 by 1,000, so the vertex reported is $-500\beta_1/\beta_2$. If the quadratic term is positive then the profile is convex and the algebraic minimum occurs; if the quadratic term is negative then the profile is concave and the algebraic maximum occurs. Nonlinear working-capital models (Silva & Silva, 2026) often use quadratic turning points, but it is not always the case that an algebraic turning point is an economically viable threshold. A vertex is considered as a leverage minimum only if convex curvature is statistically supported, if the estimate is sufficiently precise and if the vertex is within the retained CCC range.

Sensitivity evidence is given in the final specifications. The lagged-explanatory model uses the one-period lagged CCC terms and controls. The industry-year median CCC is reported as an instrument in the 2SLS specification and Shea partial R-squared values are reported for both operating-cycle terms. Lags and industry-level instruments have been used in previous working capital and financing studies, with the specific lags and instruments varying across applications (Amin et al., 2023; Cai et al., 2024; Silva & Silva, 2026). The last column is called a dynamic specification. Lagged leverage is a characteristic of target-adjustment models (Espenlaub et al., 2025; Xin et al., 2023); however, its coefficient is not reported here and therefore can't be assessed here. Temporal ordering and an instrument label are insufficient for identification: an instrument must be relevant and satisfy the exclusion restriction. The models are therefore treated as sensitivity evidence rather than automatic causal confirmation.

4. Empirical Results

4.1. The relationship between the cash conversion cycle and corporate leverage

Table 4 shows the estimated relationship between cash conversion cycle (CCC) duration and corporate leverage. Pooled OLS and the year-fixed-effects model report negative CCC coefficients of −0.0055 and −0.0056, respectively. These estimates describe a negative average association with the controls held constant, but impose a constant slope over the cycle range. The benchmark quadratic model relaxes that restriction. Its CCC coefficient is −0.0167 and its coefficient on $CCC^2/1000$ is 0.0453, both statistically significant. The fitted profile is convex: conditional predicted leverage decreases towards the reported minimum of about 184 days and increases beyond it. The 95% confidence interval for the vertex is 157.1–210.9 days, within the retained CCC range of −100 to 365 days.

The negative part of this profile shares a point of contact with more recent evidence of the link between working capital and financing decisions, but the designs aren't equal. On the other hand, Mansour (2025) studied Egyptian industrial firms and found that a longer CCC relates to lower total and long-term debts, but higher short-term debts. The total-debt estimates also decrease in the lower part of the fitted curve, but with the positive squared term, this relationship changes at longer cycle lengths. There is also a warning at the component level that CCC should not be viewed as a single linear financing exposure. According to Flannery and Öztekin (2024), receivables and inventories are related to higher leverage, while payables are related to lower debt. The offsetting balance-sheet relationships suggest that curvature may be worthy of investigation, since CCC adds inventory and receivables days but subtracts payables days. They do not, however, explain the mechanism for the estimated vertex.

The industry and the year fixed-effects specification keeps the coefficient pattern the

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

same: the linear coefficient equals to −0.0117 and the scaled quadratic coefficient equals to 0.0302, and the minimum reported value is 194.27 days. The 95% confidence interval for its vertex is (150.9, 237.6) which overlaps the benchmark interval. In contrast, the two CCC terms are not statistically significant in the firm fixed-effects model. Support for H1 is found in the pooled and industry-controlled comparisons, but does not establish a common within-firm response. Previous research pinpoints the existence of nonlinear working-capital profiles for firm value or profitability (Aktas et al., 2015; Silva & Silva, 2026), but these studies examine different outcomes and estimate a value- or profitability-maximizing level of working capital. Their findings are not unequivocal evidence that there is a leverage minimum, nor of the 184-day estimate, but they are consistent with the general rationale for allowing nonlinear relationships.

The control variables also place the CCC coefficients in a broader financing pattern. Cash holdings and ROA have negative coefficients in the leverage regression, while firm size, capital expenditures and sales growth have positive coefficients. The negative profitability coefficient is consistent with the pecking-order argument that firms with more internal resources require less external financing (Myers & Majluf, 1984). Positive capital-expenditure and sales-growth coefficients are consistent with greater funding requirements. These interpretations remain conditional: Mansour (2025) reports positive asset-tangibility and negative firm-size and cash-holdings coefficients in the total-debt model for Egyptian firms. The controls do not identify a single financing mechanism across samples and specifications.

The reported minimum is the lowest conditional leverage on the fitted benchmark curve, rather than a recommended operating target. This distinction matters because recent international studies of firm performance tend to report a negative association with longer CCCs (Johan et al., 2024; Kiymaz et al., 2024). The profitability relationship does not determine the cycle length at which financial debt is smallest, and lower leverage does not necessarily mean a better operating result. The estimates also do not show that changing an individual firm's CCC would move its leverage along the fitted curve.

Table 4. Operating-Cycle Duration and Corporate Leverage

Explanatory Variables	(1) Pooled OLS	(2) Year FE	(3) Benchmark Quadratic	(4) Industry & Year FE	(5) Firm FE
Cash Conversion Cycle (CCC)	-0.0055 (0.0010)	-0.0056 (0.0010)	-0.0167 (0.0023)	-0.0117 (0.0023)	-0.0020 (0.0020)
CCC^2 / 1000	—	—	0.0453 (0.0076)	0.0302 (0.0076)	0.0091 (0.0057)
Firm Size	0.9635 (0.0465)	0.9662 (0.0470)	0.9597 (0.0470)	0.9353 (0.0470)	1.8344 (0.1143)
Cash Holdings	-51.0997 (0.5361)	-50.9991 (0.5406)	-51.0743 (0.5410)	-48.0564 (0.5521)	-24.2881 (0.5117)
Capital Expenditures	23.8897 (1.2107)	24.3185 (1.2224)	24.0582 (1.2247)	23.5416 (1.2222)	3.9079 (0.8416)
Return on Assets	-0.5339 (0.0108)	-0.5295 (0.0109)	-0.5240 (0.0109)	-0.5394 (0.0109)	-0.4601 (0.0103)
Sales Growth	0.0202 (0.0014)	0.0208 (0.0015)	0.0207 (0.0015)	0.0223 (0.0015)	0.0100 (0.0011)

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Table 4. Operating-Cycle Duration and Corporate Leverage

Explanatory Variables	(1) Pooled OLS	(2) Year FE	(3) Benchmark Quadratic	(4) Industry & Year FE	(5) Firm FE
Constant	18.6161 (0.6129)	21.2350 (0.6370)	21.6656 (0.6420)	20.8664 (0.7988)	9.7071 (1.3213)
Quadratic vertex (days)	—	—	184.00	194.27	107.78
Delta SE / 95% CI	—	—	(13.73) [157.1, 210.9]	(22.11) [150.9, 237.6]	(59.07) [-8.0, 223.5]
Year Fixed Effects	No	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	Yes	No
Firm Fixed Effects	No	No	No	No	Yes
Observations (N)	325,139	325,139	325,139	325,085	325,139
R-squared	0.177	0.179	0.180	0.189	0.087

Note. Dependent variable is Total Debt Ratio (% of assets). Firm-clustered standard errors are in parentheses. The quadratic vertex is a minimum only when the squared term is positive; economic interpretation also requires statistically supported curvature and in-range support.

Figure 1 shows only the quadratic part of the benchmark profile. Its approximate vertex of 184.3 days uses the rounded coefficients displayed, while Table 4 reports 184.00 days.

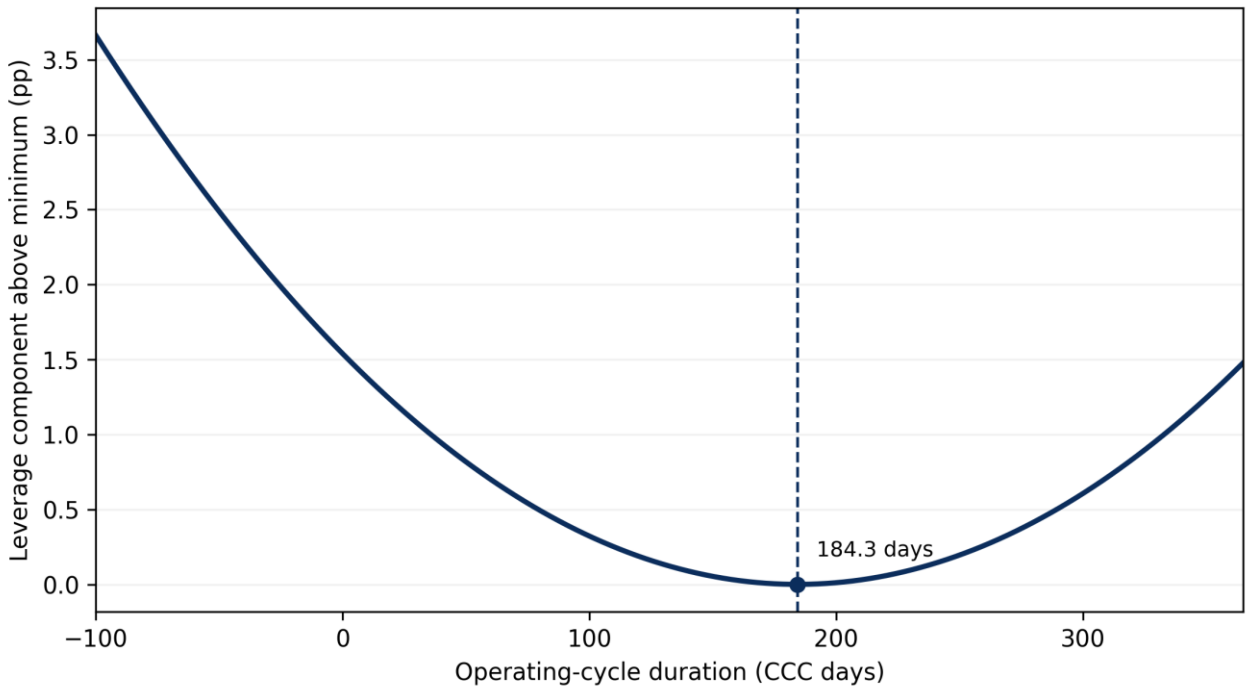


Figure 1. Debt reliance around the operating-cycle minimum

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

4.2. Heterogeneity across firms and economic settings

Debt maturity, firm size and cash holdings

Table 5 presents a breakdown of short and long-term debt, and a comparison of size and cash holding differences. The CCC coefficients for both the debt-maturity specifications have a negative linear component and positive quadratic component. The reported minimum for short-term debt is 148.37 days with a 95% confidence interval between 135.6 and 161.2 days, and for long-term debt is 189.54 days with a 95% confidence interval of 178.5 to 200.6 days. The fact that there are economic implications in distinguishing between the two maturities is important as evidence has emerged that working-capital financing options involve different debt and risk profiles. In Egyptian industrial firms, Mansour (2025) found that the longer the CCC the lower the total debt and long-term debt, but the higher the short-term debt. In their research, Ortega-Gomariz et al. (2026a) reveal that financing more of working capital needs with short-term debt corresponds to higher level of financial risk; whereas, Ortega-Gomariz et al. (2026b) show that the more that SMEs face operating risk, the less they finance the working capital needs with short-term debt and more with long-term debt. Loan-contract evidence further shows that amendments to maturity and covenants are linked to faster adjustment towards target leverage (Espenlaub et al., 2025). These studies do not identify or validate the two turning points reported here with respect to the issue of maturity. Furthermore, the short term regression and the long term regression are not based on the same number of observations so the vertices are descriptions of differences, not formally tested differences in the same sample.

Large companies have a convex profile with a minimum of 167.15 days reported. Also, the high-cash subsample has positive curvature, and a minimum of 203.88 days. In small firms, the quadratic term was not statistically significant and thus the reported algebraic vertex is not considered as a proven minimum. Adjacent evidence suggests that financing conditions matter for working-capital management, although it does not explain the statistical precision of the present estimates. Silva and Silva (2026), for instance, report a shorter profitability-maximizing net trade cycle for more financially constrained firms than for less constrained firms, and Nguyen et al. (2025) report that adjusting towards target trade receivables in Vietnam is faster in the case of firms with lower internal financial constraints. Similarly, Su and Zheng (2025) find that Chinese SMEs take longer to adjust the capital structure, especially in downturns in the credit market. The evidence on court reform also indicates a relationship between the shift to target leverage and a firm's internal liquidity (Y. Cui & Zhang, 2025). Such comparisons are only made with respect to profitability and receivables adjustment and capital-structure adjustment and not with respect to the location of a CCC–leverage minimum. Table 5, which reports on the size of the firm and high cash holdings, also includes subgroup indicators, but not as tests of the constraint measures employed in those studies. The subgroup estimates reproduce the aggregate leverage profile with different levels of precision, without identifying a financing-constraint channel for those differences.

Table 5. Debt Maturity, Firm Scale, and Cash-Buffer Heterogeneity

Explanatory Variables	(1) ST Debt Ratio	(2) LT Debt Ratio	(3) Large Firms	(4) Small Firms	(5) High Cash Buffer
Cash Conversion Cycle (CCC)	-0.0096 (0.0008)	-0.0385 (0.0021)	-0.0220 (0.0032)	-0.0074 (0.0031)	-0.0180 (0.0026)
CCC^2 / 1000	0.0324 (0.0029)	0.1015 (0.0070)	0.0658 (0.0110)	0.0177 (0.0099)	0.0442 (0.0089)

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Table 5. Debt Maturity, Firm Scale, and Cash-Buffer Heterogeneity

Explanatory Variables	(1) ST Debt Ratio	(2) LT Debt Ratio	(3) Large Firms	(4) Small Firms	(5) High Cash Buffer
Firm Size	-0.2083 (0.0147)	1.0614 (0.0422)	1.5857 (0.0958)	0.1893 (0.1070)	1.1994 (0.0566)
Cash Holdings	-4.8485 (0.2706)	-22.6615 (0.6243)	-54.3261 (0.8831)	-47.6720 (0.6492)	-33.6803 (0.5871)
Capital Expenditures	-1.6912 (0.4392)	22.6031 (1.0923)	28.5642 (2.0382)	22.1806 (1.4068)	25.2724 (1.4883)
Return on Assets	-0.1693 (0.0054)	-0.3165 (0.0121)	-0.6774 (0.0234)	-0.4567 (0.0120)	-0.4615 (0.0116)
Sales Growth	0.0018 (0.0007)	0.0151 (0.0014)	0.0291 (0.0023)	0.0158 (0.0019)	0.0241 (0.0018)
Constant	9.5440 (0.2458)	7.6960 (0.5714)	13.6594 (1.4044)	28.9492 (1.1761)	12.3452 (0.8143)
Quadratic vertex (days)	148.37	189.54	167.15	208.30	203.88
Delta SE / 95% CI	(6.53) [135.6, 161.2]	(5.64) [178.5, 200.6]	(12.87) [141.9, 192.4]	(52.92) [104.6, 312.0]	(20.04) [164.6, 243.2]
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations (N)	196,071	233,372	163,935	161,204	163,351
R-squared	0.046	0.088	0.189	0.169	0.142

Note. The reported algebraic vertex for Small Firms should not be interpreted as an identified threshold because the squared term is not statistically significant. Standard errors are in parentheses.

Firm life cycle

The Growth, Mature and Decline firms are analysed separately in Table 6. The negative linear CCC coefficient value of −0.0269 and the positive scaled quadratic coefficient value of 0.0673 show a negative linear trend and a positive quadratic trend, respectively, for mature firms. The estimates for Decline firms are, respectively, −0.0291 and 0.0735. The two specifications yield statistically supported convex profiles, with minimum values reported as 199.98 and 197.94 days, respectively. The point estimates are not too far apart and their confidence intervals overlap considerably. No formal comparison of these two vertices is reported, and the estimates alone do not indicate a difference between the two stages or distinct operating targets.

The Growth specification is not convex, the terms of the CCC are not statistically significant and the quadratic coefficient is negative. However, a common life cycle profile is not accepted by the joint interaction test ($F = 7.76$, $p < 0.0001$). Adjacent financing research is well-established in terms of stage dependence. Amin et al. (2023) report higher private-loan spreads for Introduction and Decline firms than for Mature firms. Cai et al. (2024) report higher public-debt costs and lower initial ratings for Introduction and Decline firms than for Growth and Mature firms. Xin et al. (2023) also reveal life-cycle differences in the speed at which Asian manufacturing firms adjust towards their target capital structures; Al-Hadi and Hussain (2025) report life-cycle differences in the relationship between business strategy and trade credit. These studies motivate allowing financing

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

relationships to vary across the life-cycle but none provides an estimate of a life-cycle specific CCC vertex for leverage. The result is therefore consistent with the heterogeneity predicted by H2, that is, that there is not necessarily a leverage minimising cycle at every stage.

Table 6. Life-Cycle Heterogeneity in the Leverage Relationship

Explanatory Variables	(1) Growth Stage	(2) Mature Stage	(3) Decline Stage	(4) Interacted Specification
Cash Conversion Cycle (CCC)	-0.0032 (0.0028)	-0.0269 (0.0030)	-0.0291 (0.0037)	-0.0083 (0.0044)
CCC^2 / 1000	-0.0086 (0.0095)	0.0673 (0.0102)	0.0735 (0.0122)	0.0189 (0.0137)
Firm Size	1.4582 (0.0559)	0.8361 (0.0547)	1.0483 (0.0773)	1.0234 (0.0465)
Cash Holdings	-43.1209 (0.6626)	-54.9659 (0.6890)	-49.0378 (0.8315)	-51.3709 (0.5343)
Capital Expenditures	32.8802 (1.4077)	-12.8687 (1.9257)	-36.4534 (3.6155)	10.9881 (1.2123)
Return on Assets	-0.4526 (0.0177)	-0.5137 (0.0193)	-0.4268 (0.0191)	-0.4184 (0.0112)
Sales Growth	0.0078 (0.0023)	0.0250 (0.0025)	-0.0098 (0.0032)	0.0036 (0.0014)
Constant	14.8752 (0.8510)	23.8491 (0.8060)	24.6627 (1.1860)	25.7466 (0.6702)
Quadratic vertex / moderation	-185.89	199.98	197.94	Moderation F = 7.76
Delta SE / 95% CI	(360.05) [-891.6, 519.8]	(14.05) [172.5, 227.5]	(14.91) [168.7, 227.2]	[p < 0.0001]
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations (N)	81,447	150,035	46,348	325,139
R-squared	0.198	0.197	0.176	0.200

Note. Mature and Decline models exhibit statistically supported convex minima. The Growth specification does not identify a convex minimum. Standard errors are in parentheses.

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Only the Mature and Decline estimates, with their confidence intervals, are shown in Figure 2, as they are statistically supported.

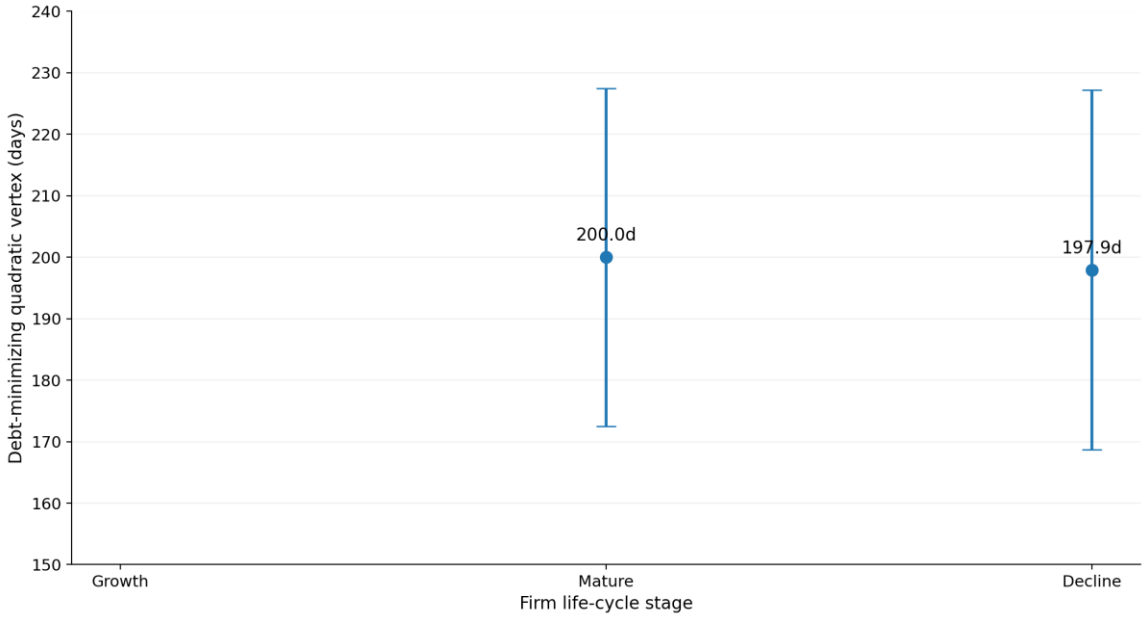


Figure 2. Life-cycle heterogeneity in the leverage-minimizing operating cycle

Economic Setting

Table 7 provides some differences between the Advanced Economies (AEs) and Emerging Market and Developing Economies (EMDEs). The linear CCC coefficient for the AE sample is −0.0379 and the scaled quadratic coefficient is 0.1256. The fitted relationship is convex with a reported minimum value of 150.98 days, and a 95% confidence interval for the minimum value of 137.9 to 164.1 days. Cross-country evidence motivates separate estimates by setting. Chang et al. (2025) link higher country-level institutional quality to shorter firm CCCs, with financing access and cost as transmission channels. Private firms' dependence on trade credit and short-term debt is influenced by legal enforcement and banking-system attributes, according to González (2025). Within-country evidence also links the establishment of bankruptcy courts with a reduction in the gap between the actual and target capital structures in China (Y. Cui & Zhang, 2025). These findings suggest that operating cycles and financing decisions depend on context. Table 7 does not include the institutional variables needed to attribute the AE profile to any of these specific financing channels.

The EMDE specification has a positive, statistically insignificant linear coefficient and a negative, significant quadratic coefficient. Its fitted relationship is therefore concave. The reported vertex of 81.32 days is a maximum on this curve and should not be treated as a leverage minimum. Recent comparative studies also show that economic context matters. Kiymaz et al. (2024) report a negative CCC–performance association in developed and emerging economies, with different component relationships. Valiña-Sotelo and Iglesias (2026) report negative DSI–ROA, DSO–ROA and DPO–ROA relationships in both G-7 and E-7 samples. These studies examine performance rather than leverage, so they do not establish the location of the EMDE maximum in Table 7.

The renewable-energy–trade-credit association also varies across country groups: Zaman et al. (2025) find an association that is positive and statistically significant in the developed-country subsample, but not statistically distinguishable from zero in the developing-country subsample. A difference in within-group significance does not itself establish a statistically significant difference between groups. Their evidence relates to the allocation of credit by suppliers,

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

while our interaction test relates to the nature of the CCC–financial-debt relationship.

The interaction test indicates different profiles across economic settings ($F = 54.50$, $p < 0.0001$), supporting H3. This result concerns the CCC–leverage profile, including its shape. J. Huynh (2024) links greater banking uncertainty to shorter cash cycles, with a stronger relationship among more indebted and financially constrained firms. Table 7 does not measure banking uncertainty or separate legal, banking and capital-market mechanisms. Its AE–EMDE indicator therefore establishes profile heterogeneity, but does not identify the institutional feature responsible for it.

Table 7. Economic-Setting Heterogeneity: AEs and EMDEs

Explanatory Variables	(1) Advanced Economies	(2) EMDEs	(3) Interacted Specification
Cash Conversion Cycle (CCC)	-0.0379 (0.0033)	0.0052 (0.0030)	0.0059 (0.0031)
CCC^2 / 1000	0.1256 (0.0119)	-0.0321 (0.0097)	-0.0358 (0.0097)
Firm Size	1.0526 (0.0651)	1.0615 (0.0722)	0.9944 (0.0472)
Cash Holdings	-47.3897 (0.7369)	-56.0819 (0.7812)	-50.8389 (0.5355)
Capital Expenditures	22.4142 (1.9204)	24.3388 (1.5438)	23.4840 (1.2298)
Return on Assets	-0.4743 (0.0138)	-0.6296 (0.0185)	-0.5251 (0.0112)
Sales Growth	0.0149 (0.0021)	0.0269 (0.0020)	0.0200 (0.0014)
Constant	18.8862 (0.9056)	23.7962 (0.9429)	20.6757 (0.6511)
Quadratic vertex / setting test	150.98 (minimum)	81.32 (maximum)	Divide F = 54.50
Delta SE / 95% CI	(6.67) [137.9, 164.1]	(27.17) [28.1, 134.6]	[p < 0.0001]
Year Fixed Effects	Yes	Yes	Yes
Observations (N)	183,711	141,428	325,139
R-squared	0.182	0.196	0.181

Note. The AE specification is convex and the reported vertex is a leverage minimum. The EMDE specification is concave; its 81.32-day vertex is therefore a leverage maximum, not a debt-minimizing threshold. Standard errors are in parentheses.

Joint life-cycle and economic-setting comparisons

Tables 8 and 8B are a combination of life-cycle and economic classifications. Quadratic vertices are reported in Table 8 (163.37 days for AE Growth firms, 164.89 days for AE Mature firms and 149.24 days for AE Decline firms). The EMDE Growth estimate is 113.07 days. The

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

joint classification allows stage and setting to be examined together. Xin et al. (2023) discuss the moderating roles of life-cycle stage and national income per capita in capital-structure adjustment, and Al-Hadi and Hussain (2025) demonstrate that the landscape of trade-credit relationships varies across the life-cycle. La Rocca et al. (2025) offer another comparison: the relationship between the age of the SME and debt levels varies with national financial development, and this moderation weakens during crisis periods. These studies feature various ways to measure development and financing, and both inspire the consideration of corporate development and economic setting as a combined entity in the CCC–leverage relationship.

Table 8. Joint Life-Cycle and Economic-Setting Quadratic Vertices

Economic Setting	Life-Cycle Stage	Estimated quadratic vertex	Std. Err.	95% Conf. Interval	*z*-stat	p-value	N
Advanced Economies	Growth	163.37	14.75	[134.5, 192.3]	11.08	<0.0001	43,443
Advanced Economies	Mature	164.89	8.29	[148.7, 181.1]	19.90	<0.0001	87,341
Advanced Economies	Decline	149.24	8.90	[131.8, 166.7]	16.76	<0.0001	26,417
EMDEs	Growth	113.07	11.74	[90.1, 136.1]	9.63	<0.0001	38,004
EMDEs	Mature	-116.94	236.64	[-580.7, 346.9]	-0.49	0.6212	62,694
EMDEs	Decline	692.41	779.58	[-835.5, 2220.4]	0.89	0.3744	19,931

Note. Vertices are algebraic solutions from subgroup quadratic models. EMDE Mature and Decline estimates lie outside the retained CCC range and are statistically imprecise. A vertex represents a minimum only when the underlying curvature is convex; the table alone does not establish that condition. Rounded zero p-values are reported as <0.0001.

The formal comparison in Table 8B places the EMDE Growth vertex 50.30 days below the AE Growth vertex. The difference, defined as EMDE minus AE, is −50.30 days (p = 0.0076), with a 95% confidence interval of −87.2 to −13.4 days. EMDE Growth also differs from AE Mature by −51.82 days (p = 0.0003). The same-stage comparisons for Mature and Decline firms do not identify statistically significant differences between economic settings. Failure to reject these null hypotheses does not establish identical profiles, because both comparisons have wide confidence intervals.

The Growth comparison is consistent with the shorter-cycle prediction in H4. Interpreting the difference as one between leverage minima still requires supported positive curvature in both subgroup models; a difference between algebraic vertices alone does not establish that both are minima.

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Table 8B. Formal Differences in Estimated Quadratic Vertices

Hypothesized Comparison	Delta vertex (days)	Std. Err.	z-statistic	p-value	95% Conf. Interval	Empirical Decision
EMDE Growth - AE Growth	-50.30	18.85	-2.67	0.0076	[-87.2, -13.4]	Reject H0 (p < 0.01)
EMDE Mature - AE Mature	-281.83	236.80	-1.19	0.2340	[-745.9, 182.3]	Fail to Reject
EMDE Decline - AE Decline	+543.17	779.28	0.70	0.4858	[-984.2, 2070.5]	Fail to Reject
EMDE Growth - AE Mature	-51.82	14.37	-3.61	0.0003	[-80.0, -23.7]	Reject H0 (p < 0.01)

Note. Delta-method Wald tests. Only the Growth-stage EMDE-AE comparison and EMDE Growth-AE Mature comparison reject equality at conventional levels.

The EMDE Mature and Decline vertices are not treated as operating thresholds because they are statistically imprecise and outside the retained CCC range. The joint life-cycle and national-income evidence in Xin et al. (2023) motivates considering stage and setting together, but does not predict the sign or magnitude of the present 50.30-day difference. Figure 3 shows the in-range estimates and their confidence intervals as fitted vertices rather than recommended cycle lengths.

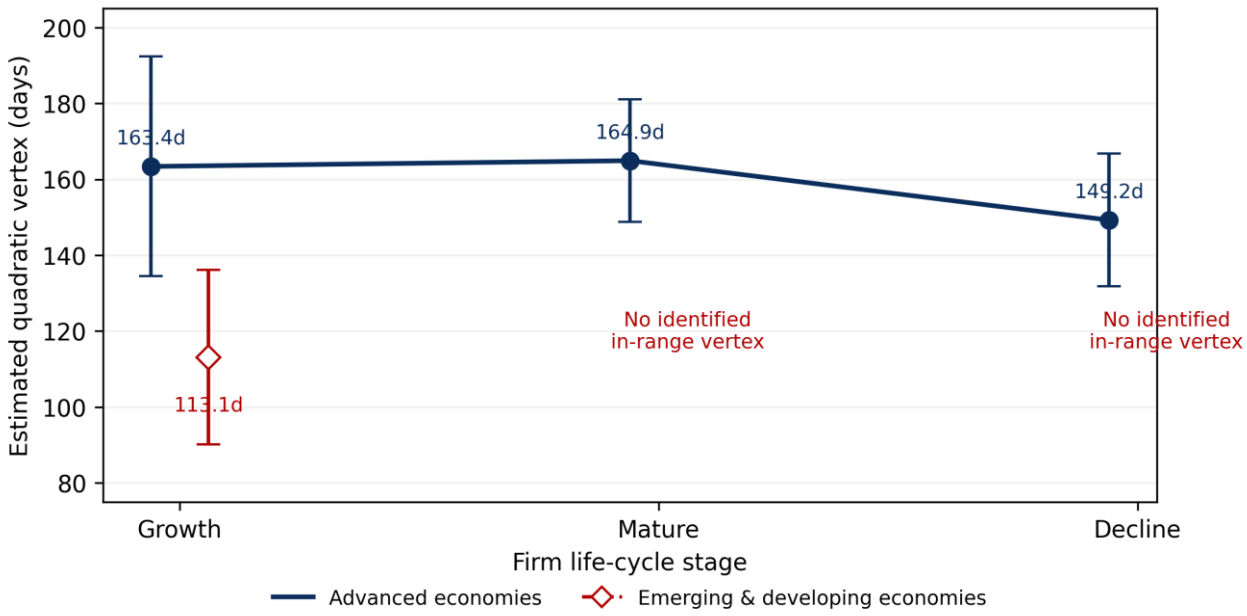


Figure 3. Estimated quadratic vertices by economic setting and life cycle

4.3. Additional analyses and robustness checks

Table 9 breaks CCC into inventory, receivables and payables periods. In the pooled quadratic model, days sales outstanding (DSO) has a negative linear coefficient of −0.0666 and a positive scaled quadratic coefficient of 0.1679.

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Days payables outstanding (DPO) has the same sign pattern, with coefficients of −0.0444 and 0.1637. The reported minima are 198.39 days for DSO and 135.73 days for DPO. Flannery and Öztekin (2024) link receivables and inventories to greater leverage, and payables to lower debt. The negative lower-range DPO slope in Table 9 is in the same direction as their payables finding, while the lower-range DSO relationship differs from their receivables result. The positive squared terms mean that the marginal association with leverage changes with component duration. Mansour (2025) estimates aggregate CCC and does not report separate component coefficients for this comparison.

The payables results should be separated from evidence on access to supplier finance. H. Cui et al. (2026) find that AI investment is positively related to trade credit, and Zaman et al. (2025) find that firms with greater use of renewable energy have more supplier credit. Wali Ullah et al. (2025) also find a positive relationship between stronger corporate culture and supplier credit. Changes in information, organization and borrower risk may therefore accompany changes in payable balances, alongside changes in operating duration. These papers do not test the relationship between the nonlinear DPO and financial debt, so these results are given as background and not as a confirmation of the vertex of the non-linear DPO–financial-debt relationship.

The quadratic term for the pooled inventory is not statistically significant. With the firm fixed effects, the inventory coefficients actually represent concavity, and the DSO still has its negative linear and positive quadratic term. This sensitivity of the components can also be seen in other outcomes studies. J. Huynh (2024) concludes that banking uncertainty in Vietnam is correlated with declining inventory days and increasing receivable and payable days. While Kiymaz et al. (2024) reveal other component–performance relationships between developed and emerging samples, Valiña-Sotelo and Iglesias (2026) uncover inverse DSI–ROA, DSO–ROA and DPO–ROA relationships for both G-7 and E-7 samples. D. Wang and Nie (2025) then determine that there is a stronger link between digitalization and shorter receivables and inventory periods than longer payment periods. These studies examine outcomes other than leverage, but show why component relationships should be considered separately and why results can vary across samples and specifications. Table 9 is then used to decompose the association with leverage, and the vertices of the association should not be summed or become a recommended aggregate CCC.

Table 9. Inventory, Receivables, and Payables Decomposition

Explanatory Variables	(1) Linear Decomposition	(2) Quadratic Decomposition	(3) Firm Fixed Effects
Days Sales of Inventory (DSI)	0.0036 (0.0013)	0.0005 (0.0033)	0.0238 (0.0034)
DSI^2 / 1000	–	0.0136 (0.0110)	-0.0541 (0.0094)
Days Sales Outstanding (DSO)	-0.0307 (0.0017)	-0.0666 (0.0044)	-0.0231 (0.0043)
DSO^2 / 1000	–	0.1679 (0.0167)	0.0537 (0.0141)
Days Payables Outstanding (DPO)	-0.0071 (0.0019)	-0.0444 (0.0045)	-0.0006 (0.0039)
DPO^2 / 1000	–	0.1637 (0.0176)	0.0279 (0.0135)

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Table 9. Inventory, Receivables, and Payables Decomposition

Explanatory Variables	(1) Linear Decomposition	(2) Quadratic Decomposition	(3) Firm Fixed Effects
Firm Size	0.9824 (0.0469)	1.0051 (0.0468)	1.8676 (0.1156)
Cash Holdings	-50.8260 (0.5360)	-50.7514 (0.5336)	-24.1836 (0.5133)
Capital Expenditures	22.0026 (1.2185)	21.1870 (1.2200)	3.6926 (0.8398)
Return on Assets	-0.5567 (0.0111)	-0.5578 (0.0111)	-0.4588 (0.0104)
Sales Growth	0.0169 (0.0015)	0.0168 (0.0015)	0.0104 (0.0012)
Constant	23.1472 (0.6460)	25.7083 (0.6778)	9.0540 (1.3372)
DSI vertex (days)	—	-17.88	—
DSO vertex (days)	—	198.39	—
DPO vertex (days)	—	135.73	—
Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes
Observations (N)	324,497	324,497	324,497
R-squared	0.187	0.191	0.088

Note. The pooled DSI quadratic term is not significant; its algebraic vertex is not interpreted. DSO and DPO show significant pooled convex curvature. Standard errors are in parentheses.

Table 10 evaluates the relationship using lagged explanatory variables and alternative estimators. The lagged specification reports a CCC coefficient of −0.0142 and a scaled quadratic coefficient of 0.0390, both statistically significant. They reproduce the benchmark convex pattern in 289,021 firm-year observations. The rounded coefficients imply an approximate vertex of 182.1 days, but a confidence interval for this vertex is not reported. Recent financing studies also use lagged variables and alternative estimators: Amin et al. (2023) lag firm covariates and supplement loan-spread tests with instrumental-variable estimates; Cai et al. (2024) lag life-cycle and firm covariates and use instrumental variables when analyzing bond outcomes; and J. Huynh (2024) uses fixed effects, GMM and 2SLS when examining cash-cycle responses to banking uncertainty. In the present analysis, the convex pattern persists with lagged regressors, but lagging does not eliminate omitted-variable bias or establish causality.

The other estimators provide less consistent support. The 2SLS specification has a negative quadratic coefficient, while the dynamic specification has a positive quadratic coefficient and a statistically insignificant linear term. This instability differs from the more stable main findings reported across endogeneity checks in adjacent studies (Amin et al., 2023; Espenlaub et al., 2025; J. Huynh, 2024). Table 10 is therefore sensitivity evidence rather than causal confirmation of the benchmark vertex. The IV

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

and dynamic vertices are approximate algebraic calculations from the displayed coefficients and have no reported confidence intervals. The lagged-leverage coefficient is also not reported, limiting assessment of the dynamic specification. A common turning point is not asserted across estimators.

Table 10. Robustness and Endogeneity Sensitivity

Explanatory Variables	(1) Benchmark OLS	(2) Lagged Explanatory (t-1)	(3) 2SLS IV Regression	(4) Reported Dynamic Model
L.Total Debt Ratio	—	—	—	Not reported
Cash Conversion Cycle (CCC)	-0.0167 (0.0023)	-0.0142 (0.0025)	0.0106 (0.0187)	-0.0008 (0.0006)
CCC^2 / 1000	0.0453 (0.0076)	0.0390 (0.0087)	-0.2131 (0.0894)	0.0086 (0.0020)
Firm Size	0.9597 (0.0470)	1.0399 (0.0488)	0.8011 (0.0580)	0.2732 (0.0096)
Cash Holdings	-51.0743 (0.5410)	-49.1474 (0.5671)	-52.0732 (0.6052)	-8.9503 (0.1953)
Capital Expenditures	24.0582 (1.2247)	34.3645 (1.2935)	19.5087 (1.5561)	22.8591 (0.4217)
Return on Assets	-0.5240 (0.0109)	-0.5352 (0.0120)	-0.5453 (0.0147)	-0.2147 (0.0042)
Sales Growth	0.0207 (0.0015)	0.0215 (0.0016)	0.0157 (0.0018)	-0.0029 (0.0008)
Constant	21.6656 (0.6420)	19.6109 (0.6740)	25.3924 (1.1753)	0.7153 (0.1729)
Implied quadratic vertex (days)	184.00	182.1 (minimum)†	24.9 (maximum)†	46.5 (minimum)†
Delta SE / 95% CI	(13.73) [157.1, 210.9]	Not available†	CI not recoverable†	CI not recoverable†
Instrumental Variables	No	No	Industry-Year Median CCC	No
First-Stage Shea R2	—	—	CCC: 0.0182, CCC2: 0.0101	—
Observations (N)	325,139	289,021	325,139	288,916
R-squared	0.180	0.179	0.140	0.820

Note. Standard errors are in parentheses. † Approximate vertices from rounded coefficients; confidence intervals are unavailable, so these entries are descriptive only. Column 4 omits the lagged-leverage coefficient.

5. Concluding Remarks

This paper investigates the nonlinear relationship between the cash conversion cycle (CCC) and corporate leverage, and whether it differs across firm life-cycle stages and economic settings. The panel includes 330,575 firm-year

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

observations for 134 economies from 2000 to 2025; the benchmark model uses 325,139 observations with the required variables. The focus on financial debt follows recent evidence linking working-capital balances and efficiency to leverage and debt maturity (Flannery & Öztekin, 2024; Mansour, 2025). It complements the literature on profitability and firm value (Aktas et al., 2015; Kiymaz et al., 2024; Silva & Silva, 2026).

The benchmark profile is convex, with minimum leverage around 184 days and a 95% confidence interval of about 157–211 days. Industry and year effects and lagged regressors preserve this pattern. The aggregate Growth model does not identify a supported convex minimum, while Mature and Decline models identify minima around 200 days. This stage dependence is consistent with evidence that firm life cycle matters for loan pricing, bond costs and capital-structure adjustment (Amin et al., 2023; Cai et al., 2024; Xin et al., 2023), although those studies do not validate the present vertices. Economic settings also differ: the AE profile is convex and the aggregate EMDE profile is concave. In the joint Growth comparison, the EMDE vertex is 50.3 days below the AE vertex. Interpreting this as a difference between leverage minima remains conditional on supported positive curvature in both subgroup models.

For managers, the findings suggest examining operating commitments alongside the amount and maturity of borrowing. The decomposition and adjacent financing evidence indicate that inventory, receivables and payables need not have the same debt associations (Flannery & Öztekin, 2024). Maturity also matters: a greater short-term share of working-capital financing is associated with greater financial risk, while SMEs facing higher operating risk use more conservative maturity structures (Ortega-Gomariz et al., 2026a, 2026b). Evidence on digitalization and executive attributes also suggests that operating processes and governance are relevant to cycle assessments (Naz et al., 2025; D. Wang & Nie, 2025). The estimated minima describe conditional debt profiles rather than profit-maximizing policies. Lowering leverage alone does not establish better operating efficiency or a target cycle length for an individual firm.

The results describe sample associations within the retained range. Firm fixed effects do not establish precise aggregate curvature, and alternative estimators do not consistently reproduce the benchmark pattern. The evidence therefore does not establish the causal effect of changing a firm's CCC. The AE–EMDE grouping covers different settings without isolating a particular legal, banking or uncertainty channel. Recent studies directly measure institutional quality, banking-system structure and banking uncertainty (Chang et al., 2025; González, 2025; J. Huynh, 2024). Evidence on supplier credit and capital-structure adjustment points to further measures, including firm-level disclosure and local law enforcement (H. Cui et al., 2026; Su & Zheng, 2025). Combined with life-cycle classifications and changes in credit availability, future work could test which financing frictions account for the profile differences documented here.

References

Aktas, N., Croci, E., & Petmezas, D. (2015). Is working capital management value-enhancing? Evidence from firm performance and investments. *Journal of Corporate Finance*, *30*, 98–113. https://doi.org/10.1016/j.jcorpfin.2014.12.008

Al-Hadi, A., & Hussain, S. M. (2025). Trade credit, corporate business strategy and corporate life cycle. *International Review of Economics & Finance*, *101*, 104141. https://doi.org/10.1016/j.iref.2025.104141

Amin, A., Bowler, B., Hasan, M. M., Lobo, G. J., & Tresl, J. (2023). Firm life cycle and cost of debt. *Journal of Banking & Finance*, *154*, 106971. https://doi.org/10.1016/j.jbankfin.2023.106971

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Benguria, F., Garcia-Marin, A., & Schmidt-Eisenlohr, T. (2026). Trade credit and relationships. *Journal of Financial Economics*, *183*, 104320. https://doi.org/10.1016/j.jfineco.2026.104320

Cai, K., Lee, H., & Zhu, H. (2024). Impacts of firm life cycle on bond ratings and yields. *Journal of Financial Research*, *47*(4), 1083–1117. https://doi.org/10.1111/jfir.12390

Chang, C.-C., Kyi, S.-S., & Chen, Y.-W. (2025). How does the quality of institutions influence the cash conversion cycle of firms? *Pacific-Basin Finance Journal*, *92*, 102783. https://doi.org/10.1016/j.pacfin.2025.102783

Cui, H., Wang, Y., & Wang, B. (2026). Does artificial intelligence contribute to soliciting trade credit? *International Review of Economics & Finance*, *107*, 105097. https://doi.org/10.1016/j.iref.2026.105097

Cui, Y., & Zhang, Y. (2025). Financial stability strategies: Bankruptcy courts and corporate capital structure adjustment. *International Review of Economics & Finance*, *99*, 104026. https://doi.org/10.1016/j.iref.2025.104026

Dash, S. R., Sethi, M., & Swain, R. K. (2023). Financial condition, working capital policy and profitability: Evidence from Indian companies. *Journal of Indian Business Research*, *15*(3), 318–355. https://doi.org/10.1108/JIBR-12-2020-0378

Dickinson, V. (2011). Cash flow patterns as a proxy for firm life cycle. *The Accounting Review*, *86*(6), 1969–1994. https://doi.org/10.2308/accr-10130

Espenlaub, S., Khurshed, A., & Neufeld, A. (2025). Loan amendments and capital structure. *International Review of Financial Analysis*, *102*, 103924. https://doi.org/10.1016/j.irfa.2025.103924

Flannery, M. J., & Öztekin, Ö. (2024). Working capital balances and financial policy. *Journal of Corporate Finance*, *87*, 102618. https://doi.org/10.1016/j.jcorpfin.2024.102618

González, V. M. (2025). Influence of legal environment and banking system on trade credit in private firms. *Journal of Business Finance & Accounting*, *52*(4), 1762–1783. https://doi.org/10.1111/jbfa.12862

Huynh, J. (2024). Banking uncertainty and cash conversion cycle. *Pacific-Basin Finance Journal*, *88*, 102552. https://doi.org/10.1016/j.pacfin.2024.102552

Huynh, N., & Le, Q. N. (2025). From chain to capital: Supply chain risks and working capital management. *Economics Letters*, *247*, 112100. https://doi.org/10.1016/j.econlet.2024.112100

Johan, S., Kayani, U. N., Naeem, M. A., & Karim, S. (2024). How effective is the cash conversion cycle in improving firm performance? Evidence from BRICS. *Emerging Markets Review*, *59*, 101114. https://doi.org/10.1016/j.ememar.2024.101114

Khoo, J., & Cheung, A. W. K. (2024). Vintage capital and trade credit. *Accounting & Finance*, *64*(1), 507–537. https://doi.org/10.1111/acfi.13153

Kiymaz, H., Haque, S., & Choudhury, A. A. (2024). Working capital management and firm performance: A comparative analysis of developed and emerging economies. *Borsa Istanbul Review*, *24*(3), 634–642. https://doi.org/10.1016/j.bir.2024.03.004

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

La Rocca, M., Fasano, F., Staglianò, R., La Rocca, E. T., & Deloof, M. (2025). The financial life cycle of European SMEs before, during and after crisis periods. What is the role of a country's financial system? *International Review of Financial Analysis*, *104*, 104342. https://doi.org/10.1016/j.irfa.2025.104342

Mansilla-Fernández, J. M., & Milgram-Baleix, J. (2023). Working capital management, financial constraints and exports: Evidence from European and US manufacturers. *Empirical Economics*, *64*(4), 1769–1810. https://doi.org/10.1007/s00181-022-02295-5

Mansour, K. (2025). Working capital efficiency and capital structure decisions in Egypt: The effect of foreign currency exchange risk exposure under IAS 21. *Asian Journal of Accounting Research*, *10*(1), 103–124. https://doi.org/10.1108/AJAR-12-2023-0411

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Naz, M. A., Ali, R., & Elamer, A. (2025). The impact of CEO attributes on working capital management: Insight from gender, financial literacy, and experience. *Business Strategy & Development*, *8*(2), e70134. https://doi.org/10.1002/bsd2.70134

Nguyen, L., Huynh, L., & Luu, T. (2025). Financial constraints and the speed of adjustment of trade credit extension: The case in an emerging country. *Cogent Economics & Finance*, *13*(1), 2524573. https://doi.org/10.1080/23322039.2025.2524573

Ortega-Gomariz, A., García-Teruel, P. J., & Martínez-Solano, P. (2026a). Financing working capital requirements and financial risk-taking in SMEs. *Managerial Finance*. Advance online publication. https://doi.org/10.1108/MF-07-2025-0496

Ortega-Gomariz, A., García-Teruel, P. J., & Martínez-Solano, P. (2026b). Operating risk and financing working capital strategies in SMEs. *Revista de Contabilidad – Spanish Accounting Review*. Advance online publication. https://doi.org/10.1108/SAR-03-2026-0005

Petersen, M. A., & Rajan, R. G. (1997). Trade credit: Theories and evidence. *The Review of Financial Studies*, *10*(3), 661–691. https://doi.org/10.1093/rfs/10.3.661

Pinto, A. P. S., Henriques, C. M. R., Cardoso, C. E. O. D. S., & Neves, M. E. D. (2023). Bank credit and trade credit: The case of Portuguese SMEs from 2010 to 2019. *Journal of Risk and Financial Management*, *16*(3), 170. https://doi.org/10.3390/jrfm16030170

Silva, F., & Silva, S. (2026). Working capital management and corporate performance: The role of financial constraints. *International Review of Economics & Finance*, *106*, 104926. https://doi.org/10.1016/j.iref.2026.104926

Su, X., & Zheng, Y. (2025). Capital structure adjustment speed and legal environments: Evidence from SMEs. *Finance Research Letters*, *73*, 106612. https://doi.org/10.1016/j.frl.2024.106612

Tingbani, I., Afrifa, G. A., Tauringana, V., & Ntim, C. (2024). Trade credit and corporate growth. *International Journal of Finance & Economics*, *29*(1), 206–228. https://doi.org/10.1002/ijfe.2683

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Valiña-Sotelo, J. L., & Iglesias, E. M. (2026). Working capital management and firm performance in the G-7 and E-7 countries during extreme events such as COVID-19. *Asia-Pacific Financial Markets*. Advance online publication. https://doi.org/10.1007/s10690-026-09597-z

Wali Ullah, G. M., Khan, I., & Abdullah, M. (2025). Corporate culture and trade credit. *International Review of Financial Analysis*, *103*, 104178. https://doi.org/10.1016/j.irfa.2025.104178

Wang, D., & Nie, H. (2025). Business process digitalization and efficiency of corporate working capital management. *International Review of Economics & Finance*, *104*, 104606. https://doi.org/10.1016/j.iref.2025.104606

Wang, L., & Yang, L. (2024). Corporate ESG performance and trade credit financing: Moderating effect of life cycle. *Borsa Istanbul Review*, *24*(4), 818–827. https://doi.org/10.1016/j.bir.2024.04.012

Xin, Y., Amin, M. S., Khan, H., Zheng, J., & Quddoos, M. U. (2023). Unleashing the moderating influence of firms' life cycle stages and national income on capital structure targeting behavior: A roadmap towards sustainable development. *Sustainability*, *15*(4), 2945. https://doi.org/10.3390/su15042945

Zaman, R., Atawnah, N., Banigidadmath, D., Nadeem, M., & Liu, J. (2025). Do companies' green credentials enhance trade credit provisions? Global evidence. *Journal of International Financial Markets, Institutions & Money*, *103*, 102204. https://doi.org/10.1016/j.intfin.2025.102204