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KEYWORDS	ABSTRACT
operating cycle; SG&A overhead; cost efficiency; firm life cycle; institutional environment; supply-chain frictions; cost stickiness	This study investigates whether the operating cycle is systematically linked to corporate SGA overhead and the relationship between them is different across stages of the firm life cycle and institutional environments. There are 317,142 firm-year observations in the underlying panel, 134 economies, and the complete-case benchmark regression has 312,041 observations. The operating-cycle term is negative, the operating-cycle-squared term is positive, and there is a convex cost function with estimated minimum at 77.7 days; in the benchmark year-fixed-effects quadratic specification. The minimum is estimated to be 61.0 days in the sector-adjusted model, and approximately 9.8 days in the firm-fixed-effects model, which suggests that the evidence from within firms is not as strong as the evidence from the cross-sectional analysis. The life-cycle estimates are convex but vary in number: between 49.8 days in the Introduction and 82.4 days in the Growth stage. But formal Delta-method tests in the joint life-cycle-by-institution model are unable to show statistically significant differences between advanced and emerging/developing economies. Component models further show that receivables collection has an economically interpretable interior vertex, while inventory and payables vertices fall outside observed support. Lagged, instrumental-variable, high-cash, and post-2010 sensitivity specifications preserve the broad convex pattern, but the available diagnostics do not justify causal claims. The evidence therefore supports a contingent operating-cost trade-off rather than a universal policy target: moderate operating-cycle duration is associated with lower SG&A overhead in pooled and sector-adjusted models, while the location and precision of the estimated minimum depend on specification, firm characteristics, and organizational stage.
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Introduction

However, a lot of the resources that create overheads are invested via normal operating choices, and so corporate cost efficiency is frequently regarded as a result of scale, technology, strategy, and managerial discipline (Tanmanee et al., 2026; Xiao et al., 2026). The level of procurement, warehousing, planning and distribution effort is influenced by inventory policies; the effort required for billing, monitoring, collection, and dispute resolution effort is affected by customer credit policies; and the effort required to purchase, vendor, and manage the financing administration for suppliers is affected by supplier-payment policies (Grützner et al., 2025; Kalla et al., 2026). Some of these activities are included in selling, general and administrative expenses. The first research question is whether there is an interior region where that coordination burden is relatively low, and whether the location of that region systematically changes with organizational maturity and the institutional context.

There is no a priori reason why the relationship will have to be monotonic. Very short operating cycles may require a high level of operational discipline. Low inventory buffers lead to higher risks of emergency ordering, rescheduling production, expedited transport, service failures or lost sales recovery efforts. Very strict customer-credit policies can lead to more screening and renegotiation, and more collection efforts, with the potential impact of putting pressure on commercial relationships and leaving procurement staff with high levels of exception management. However, too long cycles can lead to higher insurance costs, credit administration, collection, monitoring and warehousing costs. This trade-off can be understood using a transaction cost economics perspective that sees governance mechanisms as methods to reduce the costs of organizing exchange (Ketokivi & Mahoney, 2020).

In this research, we test this proposition and make our evaluation on a broad cross-section of publicly listed non-financial firms across the globe. The raw analytical data includes 317,142 firm-year data observations for 134 economies. The principal's regression sample has 312,041 observations after they have been subjected to complete data requirements for the benchmark controls. The empirical design includes pooled, year fixed-effects, sector adjusted and firm fixed effects specifications; alternative scaling and cross-sectional partitions; the inventory, receivables and payables model; Dickinson (2011) classifications of the life-cycle stages; institutional subsamples, joint life-cycle by institution cells and a number of sensitivity specifications.

The quadratic model shown in the benchmark does have a convex relationship, but the vertex of the curve, which is the point of minimum cost, is about 77.7 days and not 172.5 days. The minimum is pushed towards 61 days by the sector-and-year fixed-effects specification. In contrast, the linear component of the firm-fixed-effects specification is not significant, and the estimated vertex is 9.8 days with a confidence interval that includes negative numbers, suggesting that the key evidence is not from the within-firm variation, but from cross-sectional and sector-adjusted variation.

The positive quadratic terms and in-range vertices are found in all five life-cycle subsamples, with estimates of 49.8 days for Introduction, 82.4 for Growth, 60.5 for Mature, 67.6 for Shakeout, and 77.3 for Decline. The joint institutional tests do not, however, reveal any statistically significant differences, however, between advanced and emerging/developing economies. In the six Growth-Mature-Decline cells, the cost-minimizing vertices vary from 63.6 to 83.4 days and no formal cross-institution or within-institution contrasts in Table 9 are significant at conventional levels. Therefore, the institutional setting seems to be more important for cost levels and sizes of the coefficient than for a significantly different cost-minimizing cycle length.

There's another warning with the component decomposition. The optimal value for the interior vertex of the employee's receivables collection is 178.6 days, which is statistically and economically interpretable. The inventory specification, on the other hand, suggests a vertex significantly outside the observed support; and the payables model suggests a vertex above the maximum operating-cycle boundary of the sample. The extrapolated values should not be referred to as managerial optima.

The remainder of the paper is organized as follows: Section 2 reviews the literature and develops the hypotheses, Section 3 presents the data, variable construction and methodology, Section 4 reports the empirical results and their discussion, and Section 5 presents the conclusion, policy implications, limitations and future research directions. The appendix reports robustness and sensitivity results.

Literature Review and Hypotheses Development

Operating-Cycle Duration and SG&A Cost Efficiency

The normal operating cycle is the cycle during which cash is turned into inventories, then into sales, and subsequently into receivables, and finally into cash as debts are settled. Research into finance generally sees this cycle as an indicator of short-term capital commitment (Cheng et al., 2026; Shrivastav et al., 2026). The direction of the choice has been found to be context dependent, as additional operating assets can help sales and mitigate disruption, while reducing financing capacity (Aktas et al., 2015; Baños-Caballero et al., 2014).

An advantageous result to test this trade-off is the SG&A expenses, which are a reflection of many of the organizational resources needed to coordinate the operating cycle. Anderson et al. (2003) found that this cost often adjusts asymmetrically as a function of activity, and more recent research indicates that the asymmetry is a result of deliberate decisions to retain resources and adjust resources (Anderson et al., 2007; Weiss, 2010). Banker and Byzalov (2014) construct a powerful incomplete cost adjustment model, and C. X. Chen et al. (2012) tie the asymmetric SG&A dynamics relationship with agency and governance dynamics.

Recent research supports the strategic and supply-chain interpretation of SG&A: Ballas et al. (2022) find that strategic orientation is related to various types of SG&A cost asymmetry, which

suggests that the resource commitment may signal deliberate business models rather than just current sales. Chiang et al. (2025) demonstrate that, at a lower stage of the relationship, there is a positive relationship between strategic alignment with major customers and cost stickiness, particularly the stickiness of the SG&A. Finally, Berg et al. (2024) demonstrate a negative correlation between more aggressive working-capital management and lower cost stickiness, suggesting that working-capital discipline and SG&A adjustment capacity are both driven. Recent studies further validate the governance and organizational mechanisms of SG&A stickiness (Chen et al., 2025; Hosomi & Ge, 2025) and the strong association between working-capital aggressiveness and cost flexibility (Berg et al., 2024). Extending credit to customers, holding inventories to ensure service, and negotiating with suppliers for payment all involve the firm in a series of ongoing exchanges that need to be monitored and coordinated. These organizational costs can thus be an important channel through which the impact of liquidity policy on performance can be understated in a cost-efficient model that neglects such cost.

Low inventories can lead to higher stockout risk and less robustness in production schedules. Procurement teams can react with smaller and more frequent orders, with emergency sourcing, premium freight and exception handling. Likewise, a tight policy on receivables may lead to more stringent credit screening, follow up contacts with creditors, customer disputes and renegotiations. Such activities could reduce the capital committed to operations, but increase the amount of administrative resources needed to maintain the policy.

The cost mechanism is reversed at the "other" end. There are extra costs for warehouse space, insurance, inventory tracking, cycle counting, shrinkage and obsolescence management for large inventories. An extended period for the receipt of goods can lead to greater requirements for credit analysis, account monitoring, collection staff, outside collection agencies, and litigation. This is especially important with transaction cost economics, in which governance solutions to the costs of governing exchange are not only about the cost of producing the product or service but also about the cost of managing the exchange (Ketokivi & Mahoney, 2020). Too narrow and too broad operating policies can, therefore, increase the cost of coordination.

Hence the resulting empirical prediction is not linear but convex. The overheads should decrease as the companies grow away from an operationally fragile extreme, and increase once the carrying and monitoring costs outweigh the operation costs.

Firm Life Cycle and Cost Behavior

Corporate life-cycle theory predicts that the resource constraints and coordination technologies of firms will shift with the progress of the firms (Ghazali et al., 2026a). Dickinson (2011) identifies life cycle stages based on cash flows from operations, investments, and financing, offering a classification that is less industry-specific or size-specific than the others proposed. Many other alternative life-cycle approaches (based on earned/capital mix) have been employed as well (DeAngelo et al., 2006; Ghazali et al., 2026b). There is generally unpredictable demand, the process is not fully standardized, and there is a lack of access to finance for Introduction firms.

Growth companies rapidly scale up production and distribution before systems and routines are optimised. Established companies are likely to have more stable product markets, logistics networks and have better internal control measures and cash generation. Shakeout and Decline companies face the challenges of restructuring, reduced buying pressures, and possible excess resources (Ashraf et al., 2025; Zisis & Naoum, 2023). These differences should influence both the amount of SG&A and the duration of the operating cycle at which the coordination costs are minimized.

This is a complementary mechanism provided by the cost-stickiness literature. Using firms from the Gulf Cooperation Council countries, Alqahtani et al. (2022) find that the life-cycle position has a correlation with corporate financial decisions and the SG&A expenses, thus supporting the notion that overhead policies vary systematically with the organizational stage. Recent evidence also shows that cash conversion cycle is correlated with life-cycle stage; Sethi and Bapat (2026) provide evidence on Indian manufacturing companies that cash conversion cycle was lower during the growth and mature stages but higher during introduction and decline stages. Other studies also show that the characteristics of working capital and cost behaviour differ across the life cycle (Habib & Hasan, 2019; Z. Wang et al., 2020). On the cost-behavior side, complementing Hosomi and Ge (2025) is the finding that the higher the intensity of organizational capital, the stronger the stickiness of SG&A cost in the intermediate range of sales changes, where the costs of administration (and, accordingly, the overhead) are embedded in the capital resources of the organization, and the costs of this capital are stage- and capability-dependent. Asymmetry in Costs in relation to downside flexibility is found to differ across the life-cycle stages, and can be more pronounced in growth firms (Zisis & Naoum, 2023).

The claim in question is comparative: the configuration and the bend of the cost surface can differ with the stage of the organization, due to the changing technology of coordination. The ordering of estimated minima by the life cycle is a question of fact not a question of right or wrong.

Institutional Environment and Operating-Cycle Frictions

There are multiple pathways through which operating costs can be influenced by institutional environments (Chang et al., 2025; L. Wang et al., 2025). The impact of contract enforcement on the cost of collecting receivables and resolving supplier disputes. Transportation and logistics infrastructure affects the amount of inventory needed to maintain service reliability. Financial depth and factoring markets affect how much firms can dissave internal liquidity constraints from commercial credit policy. Bargaining over outstanding debts is affected by bankruptcy mechanisms and creditor rights. According to North (1990), the institutional perspective and the law-and-finance tradition focus on the fact that such formal rules affect the extent and nature of transaction costs and financing decisions, and that where formal institutions are missing, alternative governance structures can emerge in emerging markets (Allen et al., 2005; La Porta et al., 1998).

In less robust institutional settings, the firm may carry more stocks as a hedge against unreliable stock supply, which could cause the cost-minimising region to shift towards longer durations. However, more lax contract enforcement could also lead to higher costs of extended customer credit and would promote shorter credit terms. Likewise, when access to formal finance is constrained, companies may increasingly be compelled to use supplier credit, which may cause the payables to become shorter and thus reduce the net cycle. The net effect of offsetting supply, credit and financing channels is therefore the institutional effect on the aggregate operating cycle vertex.

Supply-chain studies recently point to the importance of these contingencies (Camel & Touriki, 2026; Shao et al., 2025). Lower supply chain risk and superior organizational performance are linked to supply-chain finance, but this link varies depending on the environmental dynamism, according to Beka et al. (2022). The alignment of suppliers and customers has an impact on cost stickiness, as demonstrated by Chiang et al. (2025); thus, relational conditions can affect the reallocation of SG&A resources. Comparative evidence from developed and emerging economies indicates that there is an inverse relationship between the cash conversion cycle and the performance of the firm both in developed economies and emerging economies (Boisjoly et al., 2020; Kiyamaz et al., 2024).

As such, this paper makes a distinction between two empirical questions in the institutional analysis. The first question is whether there are differences in the fitted cost curves between advanced and advanced/developing economies. The second question is whether or not the estimated cost minimizing vertices are significantly different, which is more difficult to answer. A curve may have various intercepts, slopes, and curves but still have the same vertex. It is thus essential to conduct formal Delta-method tests of vertex differences prior to the establishment of the conclusion that the institutional conditions allow for different targets of the operating cycle.

Hypotheses Development

H1: Operating-cycle duration has a U-shaped relationship with SG&A overhead, with a cost-minimizing duration within the observed range.

H2: The shape and cost-minimizing duration of this relationship vary across firm life-cycle stages.

H3: The shape and cost-minimizing duration of this relationship differ between advanced and emerging/developing economies.

Research Gap

The importance of the question is due to the fact that two powerful streams of literature have been growing essentially side by side. The research in corporate finance about short-term operating assets has been mainly focused on profitability, value and financing requirements (Aktas et al.,

2015; Kieschnick et al., 2013). In contrast, research in managerial accounting has been able to document that SG&A costs are strategically decidable, resource commitment-sensitive, and sticky (Banker & Byzlov, 2014; Xia et al., 2025). Ballas et al. (2022) that strategic orientation is related to the direction and magnitude of SG&A cost asymmetry, and Chiang et al. (2025) link strategic alignment of the supply-chain to supplier SG&A cost stickiness. The results indicate that decisions made during operations could prove to be a crucial link between liquidity management and overhead behavior and that this link has not been well tested in a large cross-country context.

The paper makes three contributions. First, it introduces operating-cycle decisions into the SG&A cost-behavior literature and demonstrates that the pooled relation is in fact meaningfully nonlinear. Second, when it engages cost-efficiency estimates with the theory of the corporate life-cycle, it describes in a large-sample manner how fitted cost minima change along the steps of the corporate life-cycle. Third, it achieves discipline of the institutional interpretation by estimating several subgroups and conducting formal difference tests.

Data, Variable Construction and Methodology

Data

The source data set includes all non-financial corporations in 134 economies that are listed on national public markets. Before complete case restrictions, there are 317,142 firm-year observations in the source tables and 24,309 public firm-observations. The principal estimation sample consists of all the 312,041 observations that have a complete set of the benchmark variables. The numbers of observations in the benchmark sample are as follows: 37,019 Introduction observations; 77,535 Growth observations; 144,789 Mature observations; 8,065 Shakeout observations; 44,633 Decline observations. The split between advanced economies and emerging and developing economies is 176,947 observations for the advanced economies and 135,094 observations for the emerging and developing economies.

There is a discrepancy in the materials with regard to the end year. Some of the narrative labels were for 2000-2025, and Table 1 does contain a narrative temporal coverage entry of 2000-2022, and the annual-trend entry supplied ends in 2022. The updated manuscript thus employs the year 2000-2022 in its text. The authors should ensure that the final fiscal year is accurate from the actual estimation dataset and only change if additional years are shown in the data.

In the source analysis, the continuous variables are winsorized at the first and ninety-ninth percentiles. The range of operating-cycle duration is between -100 and 365 days. The bound is crucial for interpretation: When a quadratic vertex is outside this interval, it is an extrapolation and is not referred to as a cost-minimizing point. This also holds true for models that are specific to the components, which also have ranges of observation. This support check is particularly applicable to the inventory and payables decompositions, because the algebraic vertices are located far outside of the data region.

The dependent variable is SG&A overhead ratio, which is selling, general and administrative expense/revenue x 100. An alternative specification scales SG&A by total assets, to test for a main pattern that might be revenue-scaled. The mean of the descriptive statistics for the sources is 19.55%, the median is 14.25% and the cross-sectional variation is wide with the winsorized maximum being more than 120% of revenue.

$$\text{SG\&A overhead ratio}_{it} = \frac{\text{SG\&A expense}_{it}}{\text{Revenue}_{it}} \times 100$$

The most important explanatory variable is operating-cycle duration, which is defined as the conventional cash conversion cycle (CCC): days sales of inventory (DSI) + days sales outstanding (DSO) – days payables outstanding (DPO). The term is kept in the definition of the variables and in the tables and in the empirical discussion, but is emphasized in the paper title. The median is 77.50 days, the interquartile range is from 33.0 to 133.9 days and the sample mean is 90.44 days.

$$\text{CCC}_{it} = \text{DSI}_{it} + \text{DSO}_{it} - \text{DPO}_{it}$$

The control variables are firm size, leverage, cash holdings, capital expenditure intensity, return on assets and sales growth. These include the most important variables that affect organizational size, funding sources, liquidity, investment, profitability and growth, and which are likely to affect SG&A. There are moderate correlations between pairs of variables, and no significant multicollinearities (the highest reported variance inflation factor is 1.82 for days in inventory and the mean is less than 1.4).

Theoretical Framework and Empirical Modeling

The model in the benchmark regresses the SG&A overhead ratio onto operating-cycle duration, operating-cycle duration squared, the control vector and year fixed-effects. Additional specifications includes any sector fixed effects or firm fixed effects. Arbitrary serial correlation and heteroskedasticity within firms are allowed for by firm-clustered standard errors. If the coefficient of the squared term is positive and the coefficient of the linear term is negative, then the fitted relation will be convex. In this case, the vertex is determined by using the formula $-\frac{\beta_1}{2\beta_2}$.

The source analysis is carried out in Stata with the help of the nonlinear combining procedure and the Delta method leading to the estimation of the standard error and the confidence interval of the vertex.

$$\text{SG\&A overhead ratio}_{it} = \alpha + \beta_1 \text{CCC}_{it} + \beta_2 \text{CCC}_{it}^2 + \gamma'X_{it} + \lambda_t + \varepsilon_{it}$$

Empirical Strategy

There are three rules in interpreting. The first is that the curvature has to be statistically significant; that is, if the linear or quadratic terms are relatively small, an algebraic vertex that is

only a single occurrence is not regarded as significant. Second, the vertex should be in or near the observed support, and should be economically interpretable. Thirdly, the confidence interval needs to be read in conjunction with the point estimate. The importance of these rules is that quadratic models can have extreme turning points with small curvature coefficients. The revised paper therefore distinguishes between 'estimated vertex' and 'managerial optimum' and refrains from using normative terms to refer to the model when it does not point to the interior minimum exactly.

Alternative SG&A scaling, gross-margin partitions, firm-size partitions, and a high-cash subsample are used to analyse cross-sectional heterogeneity. Operating-component models use inventory, receivables and payables durations and their squared terms instead of aggregate cycles. The five Dickinson stages have their own separate quadratic specifications in a life-cycle analysis. The sample is divided between advanced economies and emerging/ developing economies in the institutional analyses. The analysis is performed in a joint manner and Growth, Mature, and Decline cells are estimated in each institutional group; the resulting vertices are tested for differences with nonlinear Delta-method tests.

The robustness suite contains terms of one year lagged operating cycle, two-stage least-squares specification with second and third lags as instruments and a high-cash-buffer subsample and a post-2010 sample. The tests provide information on sensitivity, but are not enough to make a causal identification. Specifically, the first-stage F statistics, weak-instrument diagnostics, and overidentification tests are not provided in the table supplied. Lagged regressors do not eliminate dynamic omitted variable bias, but do help account for simultaneity bias. The paper, therefore, reports these results as robustness and sensitivity evidence but not as evidence for a causal effect of the estimated curve.

Empirical Results and Their Discussion

Sample Characteristics and Descriptive Statistics

Table 1 compares the full analytical panel with the complete case estimation sample. Benchmark sample comprises 312,041 firm-years, with the majority of firm-years being classified as Mature firms (46.4%), followed by Growth firms (24.9%), Decline firms (14.3%), Introduction firms (11.9%), and Shakeout firms (2.6%). The share of advanced economies in benchmark observations is 56.7% and the emerging/developing economies in benchmark observations is 43.3%.

Table 1: Benchmark-sample distribution and verified study scope

Panel	Category	Observations (N)	Share of benchmark sample (%)
Institutional setting	Advanced Economies (AE)	176,947	56.71

Panel	Category	Observations (N)	Share of benchmark sample (%)
Institutional setting	Emerging & Developing Economies (EMDE)	135,094	43.29
Firm life-cycle stage	Introduction	37,019	11.86
Firm life-cycle stage	Growth	77,535	24.85
Firm life-cycle stage	Mature	144,789	46.40
Firm life-cycle stage	Shakeout	8,065	2.58
Firm life-cycle stage	Decline	44,633	14.30
Sample scope	Complete-case benchmark regression sample	312,041	100.00
Sample scope	Pre-control analytical panel	317,142	
Sample scope	Unique publicly traded firms	24,309	
Sample scope	Verified temporal coverage	2000-2022	

Note. Counts are reconstructed from the complete-case life-cycle and institutional regressions. The pre-control panel contains 317,142 firm-years; the benchmark regression sample contains 312,041 observations. The supplied source table explicitly reports coverage through 2022.

The mean of the SG&A overhead is 19.55% of revenue with a right-skewed distribution and a standard deviation of 18.78 percentage points. The average operating cycle is 90.44 days and the standard deviation is 82.28 days, so that there is enough operating cycle range to use the nonlinear models. The average inventory, receivables and payables indicate that inventory is the longest gross component, which is balanced by a significant amount of financing from suppliers. As can be seen from Table 3, there is a low simple correlation between SG&A and the aggregate cycle, as the subsequent nonlinear results are not explained by these simple correlations.

Table 2: Descriptive statistics for cost, operating-cycle, and control variables

Variable	N	Mean	Std.Dev.	p25	Median	p75	Min	Max
SG&A Overhead Ratio (% Rev)	317,142	19.552	18.777	7.956	14.254	24.513	0.894	122.550
SG&A to Assets Ratio (%)	317,142	17.082	17.622	5.918	11.314	21.461	0.561	99.896
Cash Conversion Cycle (Days)	317,142	90.438	82.283	33.000	77.500	133.900	-100.000	365.000
Days Sales of Inventory (DSI)	316,805	84.841	70.631	33.000	68.100	116.300	0.700	337.300

Variable	N	Mean	Std.Dev.	p25	Median	p75	Min	Max
Days Sales Outstanding (DSO)	316,853	70.211	52.126	35.000	59.800	92.000	1.300	282.200
Days Payables Outstanding (DPO)	316,689	65.147	50.006	31.200	52.600	84.000	3.300	278.500
Firm Scale (Log Assets)	317,142	12.174	2.050	10.806	12.094	13.468	7.383	17.462
Total Leverage Ratio (%)	317,142	22.684	19.273	5.932	19.804	34.805	0.000	86.742
Cash to Assets Ratio (%)	317,142	0.131	0.131	0.035	0.090	0.182	0.001	0.629
Capital Expenditure Ratio (%)	312,223	0.048	0.051	0.013	0.031	0.063	0.000	0.269
Return on Assets (%)	316,957	3.428	7.199	1.040	3.550	6.660	-31.220	23.030
Revenue Growth Rate (%)	317,142	11.853	29.863	-2.990	6.940	20.770	-52.240	150.370

Note. All continuous variables are winsorized at the 1st and 99th percentiles in the source analysis. Operating-cycle duration is bounded between -100 and 365 days.

Table 3: Pearson correlations and multicollinearity diagnostics

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	VIF
(1) SG&A Ratio	1.000											
(2) CCC	0.076	1.000										1.45
(3) DSI	0.219	0.758	1.000									1.82
(4) DSO	0.013	0.449	0.102	1.000								1.38
(5) DPO	0.199	-0.060	0.281	0.469	1.000							1.29
(6) Firm Size	-0.207	-0.120	-0.080	-0.049	0.034	1.000						1.18
(7) Leverage	-0.068	-0.021	0.018	-0.076	-0.019	0.096	1.000					1.22
(8) Cash Ratio	0.221	-0.042	-0.039	0.000	0.012	-0.068	-0.361	1.000				1.15
(9) CapEx	-0.071	-0.110	-0.071	-0.141	-0.072	0.018	0.084	-0.113	1.000			1.08
(10) ROA	-0.453	-0.026	-0.066	-0.130	-0.189	0.160	-0.167	-0.005	0.151	1.000		1.12
(11) Sales Growth	-0.039	-0.060	-0.047	-0.115	-0.091	-0.038	-0.008	0.028	0.127	0.180	1.000	1.06

Note. Variance inflation factors are reported in the final column. The correlation matrix is descriptive and does not incorporate fixed effects.

Baseline Results and Heterogeneity Analyses

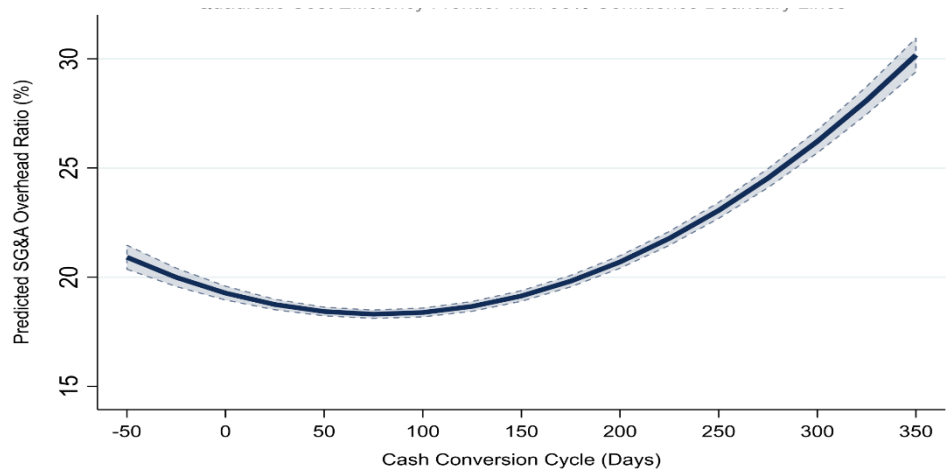
Baseline Nonlinear Cost Profile

The central evidence for H1 is in Table 4. Both linear pooled and year fixed-effects models give positive values for operating-cycle duration, the latter causing a re-interpretation of the results. Model 3 is no exception; the linear term is now -0.0249 and the squared term is positive and very significant. This leads to a convex profile, and the vertex is reported as 77.7 days (69.0 – 86.4 95% confidence interval). This fitted pattern is depicted in Figure 1, in which the predicted overhead decreases with very short operating cycles towards the middle of the observed distribution, to a minimum at the reported vertex and increases more steeply with extended cycle.

The corrected 77.7-day estimate is economically consistent with the descriptive distribution as it is very close to the sample median of 77.5 days. The model fit is consistent with the costs for coordination in lean operations in very short time periods and with the carrying, monitoring and administrative costs at long time periods. The point estimate should thus be understood as an indication of the fitted cross sectional trade-off rather than a managerial target.

Fixed-effects model (sectors and years) results in a smaller vertex of 60.95 days, and a 95% confidence interval of 48.1 to 73.8 days. The R-squared of the model also increases from 0.2865 to 0.3498, reflecting the significant variation in overhead intensity across the sectors.

Figure 1. Benchmark convex relation between operating-cycle duration and SG&A overhead



The linear operating-cycle term is not statistically significant (-0.0012), whereas the squared term is positive and significant at the level of precision shown. The average reported vertex was 9.82

days, which has a very broad 95% confidence interval of -14.8 to 34.5 days. Thus, the evidence for support of H1 is strongest in pooled, year-adjusted and sector-adjusted models, with the within-firm evidence being less clear; structural interpretations should be tempered by these.

Table 4: Baseline nonlinear models of operating-cycle duration and SG&A overhead

Independent Variables	(1) Pooled OLS	(2) Year FE	(3) Quadratic OLS	(4) Sector+Year FE	(5) Firm+Year FE
Cash Conversion Cycle (CCC)	0.0143*** (0.0011)	0.0145*** (0.0011)	-0.0249*** (0.0024)	-0.0147*** (0.0024)	-0.0012 (0.0016)
Cash Conversion Cycle Squared (CCC ²)			0.0002*** (0.0000)	0.0001*** (0.0000)	0.0001*** (0.0000)
Firm Scale (Log Assets)	-0.9723*** (0.0448)	-0.9500*** (0.0456)	-0.9695*** (0.0455)	-0.8486*** (0.0435)	-1.9953*** (0.0790)
Leverage Ratio	-0.0611*** (0.0045)	-0.0616*** (0.0045)	-0.0636*** (0.0044)	-0.0628*** (0.0042)	-0.0183*** (0.0030)
Cash Ratio	27.3636*** (0.6931)	27.6880*** (0.6970)	27.3199*** (0.6941)	25.2052*** (0.6687)	6.1403*** (0.4300)
Capital Expenditures	10.7807*** (1.1599)	10.4686*** (1.1746)	9.6200*** (1.1656)	8.9011*** (1.1157)	8.6368*** (0.5752)
Return on Assets (ROA)	-1.1867*** (0.0179)	-1.1897*** (0.0180)	-1.1712*** (0.0179)	-1.1517*** (0.0167)	-0.7250*** (0.0116)
Sales Growth Rate	0.0200*** (0.0017)	0.0193*** (0.0018)	0.0192*** (0.0018)	0.0168*** (0.0016)	-0.0080*** (0.0010)
Constant Intercept	31.1818*** (0.6031)	31.9879*** (0.6046)	33.5540*** (0.6150)	37.9691*** (0.7503)	43.9465*** (0.9012)
Estimated quadratic vertex (days)			77.70	60.95	9.82

Independent Variables	(1) Pooled OLS	(2) Year FE	(3) Quadratic OLS	(4) Sector+Year FE	(5) Firm+Year FE
[95% Confidence Interval]			[69.0, 86.4]	[48.1, 73.8]	[-14.8, 34.5]
Observations (N)	312,041	312,041	312,041	311,991	312,041
R-Squared	0.2791	0.2798	0.2865	0.3498	0.2053
Fixed Effects Specification	None	Year	Year	Sector + Year	Firm + Year

Note. Dependent variable: SG&A overhead ratio. Standard errors are clustered by firm. The reported vertices are Delta-method estimates from the source results. The firm-fixed-effects vertex is imprecise and its confidence interval spans negative values.

Cross-Sectional Heterogeneity

The results presented in Table 5 indicate that the fitted minimum location is very dependent on the outcome scaling and company characteristics. If scaled by assets, the reported vertex is 324.7 days and the confidence interval is above the 365 day sample bound. The big difference is a warning against using any one vertex as a universal model to be used in operations.

Similar and equally revealing contrasts can be shown from gross-margin partitions. For high margin firms, the vertex is estimated to be near 145.5 days and for low margin firms the vertex is estimated to be 1.9 days with a confidence interval of (-42.2, 45.9) days. However, the evidence is not sufficiently precise to show that there is any definitive ranking of optimum cycle lengths, due to the low margin vertex that is imprecise.

There is another asymmetry between firm size. The large-firm vertex has a large confidence interval around it that includes the value of zero, while the small/SME vertex has a narrow confidence interval of 83.4 to 99.1 days around it. Table 5 suggests that the cost minimising region depends on the organizational context and the definition of the outcome.

Table 5: Cross-sectional heterogeneity in the estimated cost surface

Independent Variables	(1) SG&A/Assets	(2) High Margin	(3) Low Margin	(4) Large Firms	(5) Small/SME
Cash Conversion Cycle (CCC)	-0.0439*** (0.0030)	-0.0287*** (0.0029)	-0.0002 (0.0020)	-0.0044 (0.0030)	-0.0396*** (0.0033)
Cash Conversion Cycle Squared (CCC ²)	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0000*** (0.0000)	0.0001*** (0.0000)	0.0002*** (0.0000)

Independent Variables	(1) SC&A/Assets	(2) High Margin	(3) Low Margin	(4) Large Firms	(5) Small/SME
Firm Scale (Log Assets)	-1.8291*** (0.0514)	-1.1109*** (0.0569)	-0.6066*** (0.0317)	-0.3429*** (0.0812)	-1.8673*** (0.1067)
Leverage Ratio	-0.0275*** (0.0050)	-0.0543*** (0.0059)	-0.0309*** (0.0036)	-0.0502*** (0.0057)	-0.0711*** (0.0058)
Cash Ratio	16.7929*** (0.7411)	20.2164*** (0.7780)	16.3005*** (0.6925)	13.9827*** (0.9951)	34.0842*** (0.8359)
Capital Expenditures	-7.9342*** (1.2689)	-13.7835*** (1.4803)	12.7093*** (1.0519)	-10.3451*** (1.5911)	21.4218*** (1.4384)
Return on Assets (ROA)	-0.3269*** (0.0170)	-1.3943*** (0.0183)	-1.4233*** (0.0229)	-0.3968*** (0.0290)	-1.3767*** (0.0183)
Sales Growth Rate	-0.0088*** (0.0016)	0.0125*** (0.0023)	0.0182*** (0.0019)	-0.0171*** (0.0027)	0.0329*** (0.0022)
Constant Intercept	43.5106*** (0.7075)	46.6242*** (0.7734)	21.9850*** (0.4793)	24.1389*** (1.1487)	41.6216*** (1.1789)
Estimated quadratic vertex (days)	324.74	145.51	187	24.41	91.25
[95% Confidence Interval]	[276.6, 372.9]	[133.4, 157.7]	[-42.2, 45.9]	[-3.7, 52.6]	[83.4, 99.1]
Observations (N)	312,041	155,804	156,022	157,312	154,729
R-Squared	0.1149	0.3767	0.4350	0.0673	0.3943
Fixed Effects Specification	Year	Year	Year	Year	Year

Note. The reported vertices are specification-specific. Values near or beyond sample support, or with confidence intervals spanning zero, are not interpreted as managerial optima.

Operating-Component Decomposition

Table 6 breaks down the aggregate cycle to inventory, receivables and payables. The DSO goes into the model negatively and the square of the DSO goes into the model positively, and the vertex is 178.6 days with a 95% confidence interval of 161.7 to 195.5 days. Short receivables periods can result in increased screening and collection efforts while longer periods can lead to higher monitoring, delinquency management, and dispute resolution costs.

There are no equivalent interior optima for inventory and payables. The standalone inventory specification would suggest a vertex at around -3056 days with a gigantic confidence interval that is well outside of the stated range of the inventory. The payables model suggests a vertex of 620 days, which is also outside of the observed support. The values should not be considered as meaningful targets.

Important, however, is that the aggregate operating-cycle relation should not be mechanically broken down into any one element. The net cycle includes operational and financing choices that may cancel each other out due to administration costs. The decomposition is most useful to illustrate the mechanisms: receivables administration would seem to be a central nonlinear channel, and inventory and supplier-payment policies would be primarily at the edge of the observed support.

Table 6: Operating-component decomposition

Independent Variables	(1) Inventory (DSI)	(2) Receivables (DSO)	(3) Payables (DPO)	(4) Full Decomposition
Days Sales of Inventory (DSI)	0.0494*** (0.0033)			0.0521*** (0.0032)
DSI Squared (DSI ²)	0.0000 (0.0000)			-0.0000* (0.0000)
Days Sales Outstanding (DSO)		-0.0470*** (0.0044)		-0.0796*** (0.0045)
DSO Squared (DSO ²)		0.0001*** (0.0000)		0.0002*** (0.0000)
Days Payables Outstanding (DPO)			0.0565*** (0.0041)	0.0758*** (0.0043)
DPO Squared (DPO ²)			-0.0000** (0.0000)	-0.0001*** (0.0000)
Firm Scale (Log Assets)	-0.8670*** (0.0437)	-1.0438*** (0.0453)	-1.1013*** (0.0444)	-1.0225*** (0.0434)
Leverage Ratio	-0.0644*** (0.0044)	-0.0699*** (0.0045)	-0.0555*** (0.0044)	-0.0695*** (0.0043)
Cash Ratio	28.3549*** (0.6786)	26.5952*** (0.6961)	27.0954*** (0.6916)	27.5056*** (0.6713)
Capital Expenditures	12.2017*** (1.1437)	5.5107*** (1.1663)	9.3380*** (1.1586)	7.5934*** (1.1177)
Return on Assets (ROA)	-1.1617*** (0.0173)	-1.2002*** (0.0180)	-1.1155*** (0.0178)	-1.1326*** (0.0171)
Sales Growth Rate	0.0214*** (0.0017)	0.0148*** (0.0018)	0.0213*** (0.0018)	0.0186*** (0.0017)
Constant Intercept	27.7862***	37.5563***	31.4417***	30.6539***

Independent Variables	(1) Inventory (DSI)	(2) Receivables (DSO)	(3) Payables (DPO)	(4) Full Decomposition
Estimated component vertex (days)	(0.5946) -3055.86	(0.6381) 178.64	(0.5755) 619.69	(0.6326) 619.69
[95% Confidence Interval]	[-11686.4, 5574.7]	[161.7, 195.5]	[229.8, 1009.6]	[229.8, 1009.6]
Observations (N)	311,757	311,795	311,667	311,424
R-Squared	0.3115	0.2790	0.2889	0.3294
Fixed Effects Specification	Year	Year	Year	Year

Note. DSI, DSO, and DPO are modeled quadratically. The DSI and DPO algebraic vertices are outside economically relevant support and are treated as extrapolations; DSO produces an interior, interpretable vertex.

Corporate Life-Cycle Heterogeneity

Table 7 provides estimated benchmark quadratic model for each Dickinson life-cycle stage. All the five stage regressions are reported with negative linear terms and positive quadratic terms, which resulted in in-range vertices. The resulting point estimates and confidence intervals are outlined in Figure 2. However, the minimum estimated days of Introduction firms are 49.8 days, the Growth firms 82.4 days, the Mature firms 60.5 days, the Shakeout firms 67.6 days and the Decline firms 77.3 days. The pattern is not monotonic along organizational development, which is theoretically possible since various cost mechanisms are prevailing in different stages of the development.

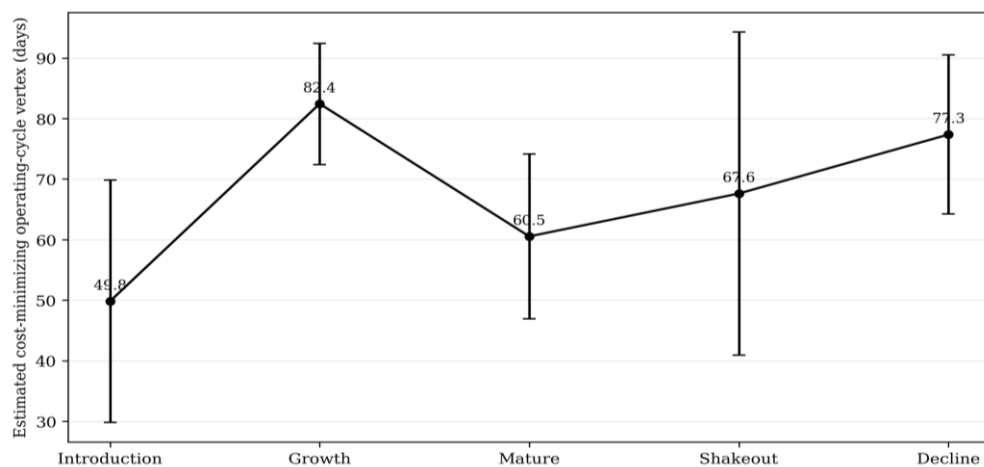


Figure 2. Life-cycle variation in estimated cost-minimizing operating-cycle vertices

The estimated vertex of growth firms is the longest of the 5 stage-specific models. Fast-growing companies might need a more diverse stock, more time to accept customer credit and more flexibility in operations to keep up with sales. The GROWTH estimate is right in the middle of the observed Support with a 95% Confidence Interval of 72.4 days to 92.4 days.

The Mature interval (46.9 to 74.1 days) is however overlapping with the Growth interval. The numerical ordering should not be interpreted to mean that the cost-minimizing point for Mature firms is statistically lower unless there was a formal nonlinear difference test using a common interacted model.

The examples of Introduction and Decline show how essential it is to be able to differentiate between overhead levels and curve location. Firms with declining inventory levels have a higher vertex around 77.3 days, suggesting that resources may have become sticky, the quality of receivables are falling, and it is hard to sell inventories when sales are falling. The estimated value for shakeout firms is 67.6 days (with a wide confidence interval) due to the limited number of benchmark observations in the stage, 8,065. In general, H2 is supported descriptively, as the value of the cost surfaces are different depending on the life cycle stage, and the difference in the vertices must be tested using the combined test described in the following.

Table 7: Life-cycle-specific operating-cost models

Independent Variables	(1) Introduction	(2) Growth	(3) Mature	(4) Shakeout	(5) Decline
Cash Conversion Cycle (CCC)	-0.0170*** (0.0048)	-0.0257*** (0.0029)	-0.0167*** (0.0029)	-0.0258** (0.0085)	-0.0250*** (0.0037)
Cash Conversion Cycle Squared (CCC ²)	0.0002*** (0.0000)	0.0002*** (0.0000)	0.0001*** (0.0000)	0.0002*** (0.0000)	0.0002*** (0.0000)
Firm Scale (Log Assets)	-1.7812*** (0.0859)	-1.0280*** (0.0491)	-0.3829*** (0.0494)	-1.3299*** (0.1540)	-1.0078*** (0.0704)
Leverage Ratio	-0.0828*** (0.0087)	-0.0481*** (0.0052)	-0.0359*** (0.0048)	-0.0563*** (0.0155)	-0.0495*** (0.0073)
Cash Ratio	33.8518*** (1.4117)	14.7185*** (0.7566)	15.8857*** (0.7866)	23.5792*** (2.6963)	27.8959*** (1.0663)
Capital Expenditures	7.1361**	-12.8624***	-5.5200**	5.8052	44.3670***

Independent Variables	(1) Introduction	(2) Growth	(3) Mature	(4) Shakeout	(5) Decline
	(2.7275)	(1.1248)	(1.7638)	(9.4035)	(3.7870)
Return on Assets (ROA)	-1.9907***	-0.4233***	-0.1685***	-1.6624***	-1.4620***
	(0.0236)	(0.0190)	(0.0170)	(0.0567)	(0.0273)
Sales Growth Rate	0.0341***	-0.0096***	-0.0297***	-0.0111	0.0107**
	(0.0035)	(0.0021)	(0.0021)	(0.0084)	(0.0036)
Constant Intercept	40.7361***	33.1815***	22.9423***	31.2106***	31.2645***
	(1.2566)	(0.7363)	(0.6919)	(2.3060)	(1.0600)
Estimated quadratic vertex (days)	49.82	82.43	60.52	67.60	77.34
[95% Confidence Interval]	[29.8, 69.8]	[72.4, 92.4]	[46.9, 74.1]	[40.9, 94.3]	[64.2, 90.5]
Observations (N)	37,019	77,535	144,789	8,065	44,633
R-Squared	0.6223	0.1069	0.0613	0.3141	0.3460
Fixed Effects Specification	Year	Year	Year	Year	Year

Note. Separate year-fixed-effects regressions are estimated for Dickinson (2011) life-cycle stages. Individual vertices are in range, but numerical differences are not equivalent to formal tests of equality

Institutional Setting and Joint Life-Cycle Moderation

The Growth-Mature-Decline estimates for each institutional setting are shown in Table 8. The six point estimates and confidence intervals are plotted in Figure 3. For the advanced economies, the vertices are 80.4 days for Growth, 64.6 for Mature and 83.4 for Decline. The figures in emerging/developing economies are 68.3, 63.6 and 67.6 days respectively. All point estimates are included in the observed range of support and each of the individual vertices is statistically distinguishable from zero by the source table.

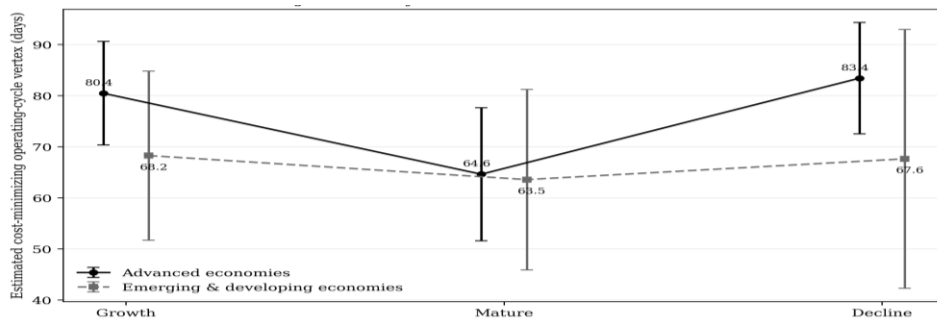


Figure 3. Joint life-cycle and institutional estimated vertices

Table 8: Joint life-cycle-by-institution estimated vertices

Institutional Setting	Life-Cycle Stage	Estimated vertex (days)	Delta SE	95% Conf. Interval	p-value	Sample N
Advanced Economies (AE)	Growth	80.43***	5.17	[70.3, 90.6]	<0.0001	41,598
Advanced Economies (AE)	Mature	64.60***	6.63	[51.6, 77.6]	<0.0001	84,523
Advanced Economies (AE)	Decline	83.38***	5.55	[72.5, 94.3]	<0.0001	25,578
Emerging & Developing (EMDE)	Growth	68.25***	8.45	[51.7, 84.8]	<0.0001	35,937
Emerging & Developing (EMDE)	Mature	63.55***	8.98	[45.9, 81.2]	<0.0001	60,266
Emerging & Developing (EMDE)	Decline	67.61***	12.93	[42.3, 92.9]	<0.0001	19,055

Note. All models include the source control set and year fixed effects. Confidence intervals use firm-clustered Delta-method standard errors.

Table 9, which reports the results of formal delta method tests of differences, contains the crucial evidence. None of the three cross institutional contrasts is statistically significant: EMDE Growth minus AE Growth is -8.4 days, $p = 0.4525$; EMDE Mature minus AE Mature is +9.0 days, $p = 0.4290$; EMDE Decline minus AE Decline is -16.8 days, $p = 0.1644$. The within institution comparisons are also not rejected as equality; AE Mature vs. AE Growth ($p = 0.2549$) and EMDE Mature vs. EMDE Growth ($p = 0.2502$).

Table 9: Formal nonlinear tests of vertex differences

Hypothesized Contrast	Difference (Days)	Delta SE	Wald z	p-value	95% Conf. Interval
EMDE Growth vs AE Growth	-8.40	11.18	-0.75	0.4525	[-30.3, 13.5]
EMDE Mature vs AE Mature	8.98	11.35	0.79	0.4290	[-13.3, 31.2]
EMDE Decline vs AE Decline	-16.82	12.10	-1.39	0.1644	[-40.5, 6.9]
AE Mature vs AE Growth	-7.00	6.15	-1.14	0.2549	[-19.1, 5.1]
EMDE Mature vs EMDE Growth	10.37	9.02	1.15	0.2502	[-7.3, 28.0]

Note. None of the reported cross-institution or within-institution comparisons reject equality at conventional levels. This table is central to the revised institutional interpretation.

Therefore, the strongest form of H3 is not supported. Different levels and coefficient sizes are linked to the institutional environment, but the available tests are nonlinear and do not indicate different cost minimizing cycle lengths. It implies that firms in different situations of institutional structure can end up with similar operating-cycle minima with different configurations of costs. Thus, short cycles may create more logistical and enforcement difficulties for emerging-market companies, while at the same time offering increased motivation to manage receivables risk, thus creating offsets in the aggregate measure.

The two general institutional groups are compared directly in table 10. The estimated vertex of the advanced economy firms is 76.1 days and for emerging/developing-economy firms it is 74.5 days. The key distinction is in the magnitudes of the coefficients and in the amounts of explanatory power – the advanced economy model has a significantly higher R-squared and has a greater linear and quadratic term. It does indicate that institutional environment has an impact on the form and magnitude of the cost surface, even if the location of the fitted minimum is not noticeably different.

Table 10: Institutional subsample models

Independent Variables	(1) Advanced Economies	(2) Emerging & Developing
Cash Conversion Cycle (CCC)	-0.0398*** (0.0037)	-0.0180*** (0.0026)
Cash Conversion Cycle Squared (CCC ²)	0.0003*** (0.0000)	0.0001*** (0.0000)
Firm Scale (Log Assets)	-1.1946*** (0.0685)	-0.8267*** (0.0571)
Leverage Ratio	-0.0454*** (0.0065)	-0.0834*** (0.0050)

Independent Variables	(1) Advanced Economies	(2) Emerging & Developing
Cash Ratio	27.4801*** (0.9530)	13.1802*** (0.8764)
Capital Expenditures	4.1286* (2.0111)	13.8929*** (1.2080)
Return on Assets (ROA)	-1.3065*** (0.0213)	-0.5398*** (0.0222)
Sales Growth Rate	0.0457*** (0.0026)	-0.0151*** (0.0018)
Constant Intercept	39.0555*** (0.9392)	26.7990*** (0.7592)
Estimated quadratic vertex (days)	76.13	74.51
[95% Confidence Interval]	[68.1, 84.2]	[61.3, 87.7]
Observations (N)	176,947	135,094
R-Squared	0.3643	0.1114
Fixed Effects Specification	Year	Year

Note. Advanced and emerging/developing economy models produce similar estimated vertices despite different coefficient magnitudes and explanatory power.

Robustness and Sensitivity Analyses

Table A1 assesses if the primary convex pattern holds under alternate timing, identification, liquidity, and sample selection. The one-year-lagged specification has a negative coefficient for lagged operating-cycle duration and a positive coefficient for the square of lagged operating-cycle duration. The source table does not have a Delta-method vertex for this model, but the reported values of coefficients suggest a minimum in a similar overall area as the contemporaneous benchmark. The lag structure introduces less simultaneity in the choice between overheads and operating cycle, but will not remove omitted variables or dynamic feedback from the model.

The 2SLS specification reports a vertex of 77.5 days with a 95% confidence interval (68.1, 86.9), so very similar to the benchmark estimate. However, the table does not include the first-stage F-statistic, partial R-squared, weak-instrument diagnostics, or overidentification tests to assess the strength and exclusion validity of the second- and third-lag instruments. Thus, the result of the IV is regarded as a sensitivity estimate and not as a confirmation of causality. A submission ready replication package should include all the first stage diagnostics and explain how lagged operating-cycle measures will impact current SG&A only due to the endogenously determined operating-cycle choice.

The minimal sample of firms with high cash buffers provides a minimum estimate of 79.2 days with a narrow confidence interval, indicating that the convex pattern is not restricted to firms with limited resources. The post-2010 sample yields a slightly lower vertex of 67.0 days, suggesting a trend toward leaner operations in the second half of the sample resulting from digitalization, supply-chain analytics and better inventory systems.

Discussion

Combined, the findings reveal a wide convex relationship between operating-cycle duration and SG&A overhead in both of the pooled and sector-adjusted specifications, and the firm-fixed-effects evidence is considerably less strong. The minimum estimated is thus regarded as a region to be fitted as a cost minimizing region, not a universal managerial goal. The numerical estimates for life cycle vary between organizations, while the comparison between the formal institutions does not indicate statistically significant differences in the estimated vertices. The component models further illustrate that an algebraic turning point does not necessarily represent an economically relevant interior minimum, especially if it is beyond observed support. The lagged, instrumental-variable, high-cash and post-2010 specifications do not change the overall shape of the results, but they do not offer a causal explanation.

Conclusion and Policy Implications

Conclusion

The revised evidence takes the discussion from an idea of an optimum level of operating liquidity to a more defensible discussion of operating cost trade-off. The standard benchmark relation is the U-shape relation, which is consistent with the existence of a trade-off between the balance-sheet efficiency and coordination costs.

This study reveals the convex relationships among operating-cycle duration and SG&A overhead in pooled, year-adjusted, and sector-adjusted models, using a large global panel. The fitted cost minimum is around 77.7 days (the sector-adjusted estimate is around 61 days) as per the benchmark specification. The firm-fixed-effects estimate is considerably less precise, and therefore, less informative with regard to a stable within-firm structural optimum. Life-cycle models generate in-range vertices with a range of about 50 to 82 days, reflecting meaningful organizational diversity. Nevertheless, formal joint tests do not provide statistically separate and cost-minimising vertices between advanced and emerging/developing economies.

The medium cycle duration is related with lower overhead, as a very lean policy can give rise to coordination costs and a very long policy will give rise to carrying and monitoring costs. The general message is that the economic consequences of operating-liquidity decisions have to do with the organizational economics of SG&A, and that well-informed inferences about curvature, support and cross-group differences can significantly enhance the credibility of nonlinear corporate-finance evidence.

Policy Implications

The important management takeaway is to never consider a “short” operating cycle as an automatic indicator of quality. Those who are seeking to aggressively reduce inventories or to tighten up credit should therefore take into account the organizational resources they will need to maintain those policies. The goal of management is not to get to 77.7 days just by accident; it's to find the company's own cost surface and realize that there's a trade-off between balance-sheet efficiency and coordination costs.

For policy makers, the institutional results highlight the need to avoid assuming that strengthening logistics or legal institutions will cause a shift in an aggregate operating-cycle optimum in a foreseeable direction. The more defensible policy goal is to reduce the cost of the coordination itself by making it more reliable to transport, more efficient to invoice digitally, more efficient to use commercial courts, and more competitive to use credit information systems and credit finance through supply chains.

Limitations and Future Research Directions

Some caveats should be kept in mind while interpreting the results. Firstly, the analysis is descriptive. The pooled and fixed-effects models do not measure cause and effect. Reverse causality is possible since managers might react to changing overhead pressures by adjusting inventory, credit or payment policies. The lagged and IV specifications alleviate some concerns, but the provided results do not contain diagnostics sufficient for a solid IV claim. New studies could take advantage of exogenous shocks in the logistics, payment regulation, customer credit characteristics, and/or supply-chain disruptions to provide stronger causal evidence. Secondly, the quadratic functional form is parsimonious but restrictive. Future research should include quadratic models with restricted cubic splines or semi-parametric smoothers, as well as extend the model to threshold regressions and formally test for the change in the sign of the derivative within the support.

Third, SG&A is an accounting category of aggregates. It contains the activities of selling, marketing, administrative and other overheads not directly related to the operating cycle. Additionally, there is some heterogeneity in how logistics costs are treated: some firms write them off as an expense, others add them to their inventory; cross-country accounting practices may also lead to additional heterogeneity. More detailed information on such activities as warehousing and distribution, customer service, credit administration, information technology, and procurement would permit direct testing of the mechanisms called for here.

Lastly, the binary of advanced versus emerging is a very crude measure of institutional conditions. Future studies should use continuous variables of logistics performance, contract enforcement, financial development, trade-credit infrastructure, digital adoption or supply-chain concentration instead of a binary classification. However, recent findings from Chiang et al. (2025) indicate that the relational attributes can be of equal importance to country-level

classifications, especially in terms of cost stickiness. It would be a logical next step to include a multilevel design incorporating firm, supply-chain, and institutional factors.

Appendix

Table A1: To be robust and sensitive

Independent Variables	(1) Lagged WCM	(2) 2SLS / IV	(3) High Cash Buffer	(4) Post-2010 sample
Cash Conversion Cycle (CCC)		-0.0334*** (0.0033)	-0.0233*** (0.0033)	-0.0237*** (0.0026)
Cash Conversion Cycle Squared (CCC ²)		0.0002*** (0.0000)	0.0002*** (0.0000)	0.0002*** (0.0000)
Lagged CCC (CCC _{t-1})	-0.0242*** (0.0026)			
Lagged CCC Squared (CCC _{t-1} ²)	0.0002*** (0.0000)			
Firm Scale (Log Assets)	-0.8871*** (0.0466)	-0.8061*** (0.0481)	-1.6299*** (0.0663)	-1.0341*** (0.0475)
Leverage Ratio	-0.0621*** (0.0046)	-0.0612*** (0.0048)	-0.0418*** (0.0066)	-0.0557*** (0.0050)
Cash Ratio	25.2694*** (0.7253)	23.6344*** (0.7567)	27.8342*** (0.8606)	28.5628*** (0.7558)
Capital Expenditures	7.0632*** (1.2231)	4.2219** (1.2917)	13.3714*** (1.7061)	10.1717*** (1.3847)
Return on Assets (ROA)	-1.0532*** (0.0200)	-0.9622*** (0.0216)	-1.2584*** (0.0207)	-1.2204*** (0.0203)
Sales Growth Rate	0.0021 (0.0020)	0.0059** (0.0021)	0.0331*** (0.0025)	0.0230*** (0.0021)
Constant Intercept	32.3306*** (0.6341)	29.6825*** (0.6943)	39.9760*** (0.9188)	32.7951*** (0.6582)
Estimated quadratic vertex (days)		77.51	79.16	66.97

Independent Variables	(1) Lagged WCM	(2) 2SLS / IV	(3) High Cash Buffer	(4) Post-2010 sample
[95% Confidence Interval]		[68.1, 86.9]	[71.2, 87.2]	[55.3, 78.6]
Observations (N)	277,878	248,855	156,764	217,888
R-Squared	0.2449	0.2169	0.3517	0.2961
Fixed Effects Specification	Year	Year	Year	Year

Note. The IV estimates are presented as sensitivity evidence since the table provided does not report all first-stage and overidentification diagnostics

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