



Firm Characteristics and Cost stickiness of Indian firms

Narayan Parab

Assistant Professor of Financial Services
Goa Business School, Goa University, Goa 403206
parabnarayan9@unigoa.ac.in

Priyanka Naik

Rosary College of Commerce and Arts
Goa 403707

Moses Prakash Fernandes

Assistant Professor of Commerce
Rosary College of Commerce and Arts, Goa 40370
moses@rosarycollege.ac.in

Abstract

This study examines how firm characteristics affect cost stickiness among large-, mid-, and small-cap companies in India. The sample comprises non-financial firms listed on the National Stock Exchange from 2015 to 2025. The study uses balanced panel data to examine asymmetric cost behaviour, incorporating firm-specific attributes as moderators of the relationship between cost and changes in sales. The study finds that small-cap companies' cost stickiness is influenced by Profitability, Growth, Age, and Leverage, whereas in mid-cap companies, it depends on lifecycle stage: young firms show aggressive cost-cutting, while mature firms exhibit strategic spending. For large companies, profitability affects cost stickiness, indicating high operational discipline. The findings of this study offer actionable insights for corporate managers, financial analysts, and investors, particularly regarding how cost structures should be managed or evaluated in relation to firm size and financial health. This study is among the early investigations of evaluating firm-specific determinants of cost stickiness across different firm sizes in an emerging economy.

Keywords *Cost stickiness, asymmetric cost behaviour, emerging markets, panel data, market capitalization, India.*

Introduction

Understanding how costs respond to fluctuations in business activity is a fundamental aspect of corporate decision-making. Accurate cost behaviour models are essential for managers evaluating strategic shifts, accountants conducting variance analysis, and financial analysts forecasting earnings (Datar & Rajan, 2017; Lanen *et al.*, 2022; Weiss, 2010). Investors similarly rely on these dynamics to assess risk and long-term value. Traditionally, variable costs were assumed to move strictly in proportion to business activity. However, Anderson *et al.* (2003) demonstrated that costs decrease much more slowly when revenues decline than they increase when revenues rise. This asymmetric response, termed "cost stickiness," represents a significant deviation from traditional models, often actively reducing investment efficiency due to managerial inertia and resource misallocation (Fahmy & Mohamed, 2025).

A robust body of literature documents cost stickiness across countries and industries (Banker & Byzalov, 2014; Calleja *et al.*, 2006; Fourati & Ghorbel, 2020; Subramaniam & Weidenmier, 2016; Via & Perego, 2014; Xu & Sim,

2017). These studies highlight the critical role of managerial discretion. Managers frequently retain idle resources during temporary downturns to avoid adjustment costs Anderson *et al.* (2003). Furthermore, when managers hold optimistic expectations regarding sales recoveries (Banker & Byzalov, 2014) or harbour empire-building incentives (C. X. Chen *et al.*, 2012), they resist cost reductions, exacerbating stickiness.

The implications are profound. Higher cost stickiness increases future earnings volatility, diminishing the precision of analysts' forecasts (Hartlieb & Loy, 2022; Weiss, 2010; Ciftci *et al.*, 2016). These firms often face lower analyst following and elevated stock price crash risks (Habib & Costa, 2020). Conversely, in emerging economies, stickiness may mitigate crash risks and enhance long-term value, particularly when accompanied by transparent financial reporting (Tang *et al.*, 2020; Yang *et al.*, 2020; Fahmy & Mohamed, 2025; Golden *et al.*, 2020; Salehi *et al.*, 2018).

Despite this extensive research, literature predominantly focuses on developed economies, leaving a critical gap regarding emerging markets exposed to high uncertainty. Furthermore, core firm-specific attributes—such as profitability, age, size, growth, value, and leverage—are routinely relegated to mere control variables. This obscures their direct impact on resource management. Because financial constraints and operational flexibility evolve as a business expands, the impact of these traits on cost decisions is inherently heterogeneous. This study investigates the firm-specific determinants of cost stickiness across large-cap, mid-cap, and small-cap Indian companies. By treating these characteristics as primary moderators, this research expands the literature on emerging economies and proves that cost behaviour varies fundamentally across market capitalizations. These insights equip stakeholders to abandon "one-size-fits-all" assumptions, enabling accurate, size-adjusted forecasting.

The article's structure is as follows: Section 2 develops hypotheses, Section 3 outlines the methodology, Section 4 presents findings, and Section 5 offers conclusions and policy implications.

Literature Review and hypothesis development

Macroeconomic and Institutional Constraints

The foundational concept of asymmetric cost behaviour was first identified by Noreen and Soderstrom (1997) in their analysis of hospital overheads, which revealed that costs do not strictly change proportionally with activity levels. Anderson *et al.* (2003) expanded on this by demonstrating asymmetric behaviour in Selling, General & Administrative (SG&A) costs for US industrial firms, terming this phenomenon "cost stickiness" and attributing it to the resource adjustment costs incurred during fluctuating business cycles. Subsequently, a global body of literature has confirmed the presence of cost stickiness across various cost types, industries, and geographic regions (Abu-Serdaneh, 2014; Banker & Byzalov, 2014; Calleja *et al.*, 2006; Fourati & Ghorbel, 2020; Naoum *et al.*, 2024; Subramaniam & Weidenmier, 2016; Via and Perego, 2014; Xu and Sim, 2017). Beyond geographical boundaries, a firm's external environment heavily dictates this cost behaviour. Macroeconomic prosperity consistently exacerbates cost stickiness (Anderson *et al.*, 2003; Ibrahim, 2015; Stimolo & Porporato, 2020; Xu & Sim, 2017), while strict legal and political frameworks effectively force sticky behaviours by limiting workforce reductions during downturns (Banker *et al.*, 2013; Pan *et al.*, 2022; Prabowo *et al.*, 2017; Ra & Kim, 2023). Conversely, strong regulatory enforcement, such as China's dividend policy mandates, can reduce SG&A stickiness (Chen *et al.*, 2022). Competitive environments also heavily influence these dynamics; high market share (Cheung *et al.* 2016), introductory expansion phases (Zisis & Naoum, 2023), and intense market competition (Krisnadewi & Soewarno, 2020) all heighten the persistence of costs when sales fluctuate.

Managerial Intent and Strategic Expectations

Beyond external constraints, cost stickiness is profoundly shaped by internal managerial intent and future expectations. When executives hold optimistic sales forecasts or view downturns as strictly temporary anomalies, they deliberately retain idle resources to avoid future reinvestment costs (Anderson *et al.* 2003; Yasukata & Kajiwar, 2017).

2011). This intentional retention is further amplified when managers prioritize long-term strategic goals over short-term margin protection. For example, the pursuit of differentiation, growth, and empire-building targets consistently deters managers from cutting SG&A costs during revenue slumps (Ballas *et al.*, 2022; Banker *et al.*, 2025; Chen *et al.* 2012). Similarly, a strong preference for maintaining intellectual capital and research and development even during severe crises like the COVID-19 pandemic—forces operating costs to remain highly sticky (Hosomi & Ge, 2025; Yang & Chen, 2023). Conversely, cost behaviour tends to be much more symmetrical when managers are tightly bound to specific short-term earnings targets, forcing them to adjust labour resources strictly in line with activity changes (Dierynck *et al.*, 2012; Kama & Weiss, 2013).

Structural Composition and Asset Characteristics

A firm's structural composition and asset intensity form the second internal pillar driving cost behavior. Across both developed and emerging economies, a heavy reliance on assets, employees, and working capital intrinsically locks a firm into rigid cost structures (Anderson *et al.*, 2003; Calleja *et al.*, 2006; Stimolo & Porporato, 2020)). This rigidity manifests differently depending on the sector; fixed asset intensity primarily drives sticky costs in manufacturing, whereas employee numbers dictate COGS stickiness in service-oriented firms (Subramaniam & Weidenmier, 2016). The nature of the assets also plays a crucial role, with high intangible asset investments consistently increasing cost stickiness across varied global markets (Mohammadi & Taherkhani, 2017; Venieris *et al.*, 2015). Furthermore, a company's overarching market position dictates its financial flexibility; large operations with an established market presence and low leverage are typically well-capitalized enough to maintain slack resources during downturns without facing immediate financial distress (Costa *et al.*, 2021).

Corporate Governance and Operational Controls

Finally, the strength of a firm's corporate governance and operational oversight mechanisms acts as a critical moderator for these cost decisions. Weaker governance structures universally allow for higher cost stickiness, as seen in the absence of governance codes in Egypt Ibrahim (2015), non-rigorous systems in Europe (Calleja *et al.*, 2006), and poorly governed Chinese firms that misallocate IPO proceeds toward overly optimistic expansion (Zhang *et al.*, 2019). Internal weaknesses, such as inadequate external audits and poor internal controls, similarly exacerbate cost rigidity (Kim *et al.*, 2022; Liang *et al.*, 2014). Interestingly, board composition significantly alters this dynamic; while larger boards with non-executive members can increase stickiness (A. E. A. Ibrahim, 2018), the presence of female directors has been shown to notably reduce it (Le *et al.*, 2022). Beyond governance, operational realities such as a reliance on highly skilled labour, high employee satisfaction, and strategic corporate social responsibility activities compel managers to absorb sticky costs (Balakrishnan *et al.*, 2004; Golden *et al.*, 2020; Habib & Hasan, 2016; Kim & Ra, 2022). In stark contrast, strict financial constraints, short-term debt pressures, and credit risk exposure compel immediate cost-cutting, thereby significantly lowering stickiness (Costa *et al.*, 2021; Dai *et al.*, 2023; Habib & Costa, 2020). Similar reductions in cost stickiness are observed in firms engaging in tax avoidance (Xu & Zheng, 2018), possessing high social capital (Hartlieb *et al.*, 2020), or undergoing digital transformation (Chen & Xu, 2023).

Hypothesis Development

While prior studies extensively document cost stickiness, they largely focus on developed economies and overlook how operational scale alters these dynamics. Emerging markets remain heavily understudied in this context. Additionally, when researchers do incorporate firm-level traits—such as profitability, age, growth, value, and leverage—they typically relegate them to simple control variables. We argue that these characteristics are actually central to cost management decisions. Because financial constraints, managerial priorities, and resource flexibility naturally evolve as a business expands, the way these traits drive cost behaviour should not be uniform across the

board. By shifting the focus to treat these attributes as primary moderators rather than background controls, this study investigates how cost stickiness fundamentally adapts across different firm sizes in a developing economy. This leads to our primary hypothesis:

H1: The impact of firm-specific characteristics on cost stickiness is heterogeneous and varies significantly across different market capitalizations.

Research Methodology

Research Design

The study adopts a quantitative, panel-data-driven approach to investigate asymmetric cost behaviour (cost stickiness) among Indian small-, mid-, and large-cap firms listed on the National Stock Exchange (NSE). The methodology builds on the baseline model developed by Anderson *et al.* (2003) and the extension formulated by Weiss (2010), integrating firm-specific attributes as moderators to the relationship between cost and sales change, and diagnostic tests to ensure model robustness.

Data Sources and Sample Selection

The sample comprises firms listed on the National Stock Exchange that are part of the Nifty 100, Nifty Midcap 100, and Nifty Small-cap 100 indices. The study period covered financial years 2015 to 2025. Data were collected from the Capitaline database. Financial companies, including banks and non-banking financial institutions, were excluded because their regulatory requirements and interest-income-driven business models make their cost behaviours non-comparable to those of non-financial companies. To build a balanced panel, firms with incomplete data and those undergoing major mergers and acquisitions/restructuring were excluded. The final sample comprised 37 companies from the Nifty 100 index, 29 from the Nifty Midcap 100 index and 31 from the Nifty Small-cap 100 index.

Variable Definition and Measurement

Total expenditure is widely used to reflect a firm's cost dynamics, particularly in research where disaggregated operating expense data, such as SG&A or COGS, are prone to substantial noise (Guenther & Riehl, 2014; Ibrahim *et al.*, 2022). For firm i in year t , total expenditure is computed as follows:

$$C_{it} = \text{NetSales}_{it} - \text{PAT}_{it}$$

The baseline regression model uses the logarithmic change in this proxy:

$$\Delta \ln(C_{it}) = \ln(C_{it}) - \ln(C_{i,t-1})$$

Where C_{it} reflects the total expenditure of the firm during period t and $C_{i,t-1}$ reflects the total expenditure of the firm during period $t-1$. Intuitively, C_{it} encompasses COGS, SG&A, depreciation/amortisation, financing costs, and taxes net of other income. While PAT_{it} refers to the Profit After Tax of the firm during period t .

Independent variables

Changes in sales and a dummy variable for a decline in sales are employed as independent variables (Anderson *et al.*, 2003; Guenther & Riehl, 2014). The sales-decline dummy (D_{it}) is standard in the Anderson *et al.* (2003) framework, allowing the cost-sales elasticity to differ between periods of sales increase and periods of sales decrease.

For firm i in year t , changes in sales are computed as follows:

$$\text{Changes in sales: } \Delta \ln(S_{it}) = \ln(S_{it}) - \ln(S_{it-1})$$

Where S_{it} denotes the Net Sales of the firm during period t and S_{it-1} reflects the Net Sales of the firm during period $t-1$.

For firm i in year t , dummy for a decline in revenue is computed as follows:

$$\text{Sales-decline dummy: } D_{it} = \begin{cases} 1, & \text{if } \Delta \ln(S_{it}) < 0 \\ 0, & \text{otherwise} \end{cases}$$

The interaction term $D_{it} \times \Delta \ln(S_{it})$ captures asymmetry in cost adjustment between revenue increases and decreases (Anderson *et al.*, 2003; Guenther *et al.*, 2014). The interaction term $D_{it} \times \Delta \ln(S_{it})$ captures the incremental change in the cost–sales slope during sales declines, providing a direct test of asymmetric or sticky cost adjustment.

Moderating Variables

To explain asymmetry in cost behaviour, several firm-specific moderators $Z_{k,it}$ were incorporated in the model based on prior studies (Costa & Habib, 2023; Kim & Zhou, 2023; Li *et al.*, 2023, 2025; Restuti *et al.*, 2022; Villiers *et al.*, 2013):

Table 1: Variable Description

Variable	Variable Construction
Profitability	ROA = PAT/Total Assets
Value	Enterprise Value (EV)/ Earnings Before Interest, Taxes, Depreciation, and Amortisation (EBITDA)
Age	Natural Log of incorporation year
Size	Natural Log of Total Assets
Growth	Natural Log Percentage Change in Total Assts
Leverage	Debt to Equity Ratio

Source(s): Authors' own work

These firm characteristics are included as moderators because they proxy differences in resource adjustment costs and managerial expectations/incentives that shape whether firms retain or reduce committed resources when sales fall, driving cross-sectional variation in sticky (asymmetric) cost behaviour (Costa & Habib, 2023; Naoum *et al.*, 2023).

Model Specifications

Baseline Model

This classical cost-stickiness model, proposed by Anderson *et al.* (2003), tests whether cost responds asymmetrically to revenue increases versus decreases.

$$\Delta \ln C_{it} = \beta_0 + \beta_1 \Delta \ln S_{it} + \beta_2 D_{it} + \beta_3 (D_{it} \times \Delta \ln(S_{it})) + \varepsilon_{it} \quad (1)$$

Where;

$\Delta \ln C_{it}$ is the log change in total expenditure/ total cost for firm i in year t

β_0 is the intercept

β_1 captures the cost elasticity when sales rise ($D_{it} = 0$)

$\Delta \ln S_{it}$ is the log change in sales for firm i in year t

β_2 captures the intercept shift in $\Delta \ln C_{it}$ during revenue-decline periods, holding $\Delta \ln S_{it}$ constant

D_{it} sales decline indicator, equal to 1 if $\Delta \ln S_{it} < 0$ and 0 otherwise

β_3 captures the incremental change in the cost–sales elasticity when revenue declines; if $\beta_3 < 0$ indicates cost stickiness and $\beta_3 > 0$ indicates anti-stickiness

$D_{it} \times \Delta \ln S_{it}$ interaction, allowing the cost–sales elasticity to take a different slope in sales-decline years than in revenue-growth years

ε_{it} is the idiosyncratic error term

Extended Model with Firm and Year Effects

To absorb unobserved heterogeneity across firms and standard shocks across years, the Anderson *et al.* (2003) model was further extended by Weiss (2010). The extended model includes a fixed-effects model, including firm (γ_i) and time dummies (λ_t):

$$\Delta \ln C_{it} = \beta_0 + \beta_1 \Delta \ln S_{it} + \beta_2 (D_{it} \times \Delta \ln S_{it}) + \gamma_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Where γ_i are firm fixed effects and λ_t are year fixed effects. The key inference on stickiness still centres on β_2 . This formulation mitigates omitted-variable bias and aligns with some of the best practices for panel data studies.

The Empirical Model (Moderation Model with Firm Characteristics)

We build further on the extension based on the Anderson *et al.* (2003) and Weiss (2010) models to explore whether firm attributes condition the degree of stickiness. Interaction terms are added between each characteristic $Z_{k,it}$ and the asymmetric component $D_{it} \times \Delta \ln S_{it}$:

$$\Delta \ln(C_{it}) = \beta_0 + \beta_1 \Delta \ln(S_{it}) + \beta_2 D_{it} + \beta_3 (D_{it} \times \Delta \ln(S_{it})) + \sum_k \theta_k Z_{k,it} + \sum_k \phi_k (Z_{k,it} \times \Delta \ln(S_{it})) + \sum_k \psi_k (Z_{k,it} \times D_{it} \times \Delta \ln(S_{it})) + \mu_t + \varepsilon_{it} \quad (3)$$

Where:

$\Delta \ln(C_{it})$ log change in total expenditure/ total cost for firm i in year t.

$\Delta \ln(S_{it})$ is the log change in sales for firm i in year t.

D_{it} is a revenue decline indicator, equal to 1 if $\Delta \ln(S_{it})$ is < 0 (revenue decline), else 0.

$Z_{k,it}$ denotes the k-th firm characteristic (Profitability, Value, Age, Size, Growth, Leverage) for firm i in year t.

$Z_{k,it} \times \Delta \ln(S_{it})$ captures how each firm characteristic shifts the cost–sales elasticity in expansion periods.

$Z_{k,it} \times D_{it} \times \Delta \ln(R_{it})$ captures how each firm characteristic moderates cost stickiness during sales declines

μ_t time effects; ε_{it} idiosyncratic error term

Since each sample is restricted to firms drawn from a single capitalisation tier, they are broadly comparable in size; therefore, firm fixed effects are unlikely to add meaningful incremental control beyond that design. Consequently, we include only year effects to absorb standard macroeconomic shocks.

Estimation and Diagnostics

The model uses Pooled OLS with Year Fixed Effects to absorb economy-wide shocks, following standard panel practice (Petersen, 2008). As a robustness check, Anderson *et al.* (2003) model validates the modified Weiss (2010) findings. This fixed-effects control mitigates unobserved heterogeneity concerns (Gormley & Matsa, 2013). We use firm-clustered standard errors for valid inference, following finance panel data guidance (Cameron & Miller, 2015; Petersen, 2008). For diagnostics, we report descriptive statistics and assess multicollinearity using VIF (O'Brien, 2007). We mean-centre continuous predictors before creating interaction terms to reduce collinearity (Iacobucci *et al.*, 2016; O'Brien, 2007). Data preparation uses Python, with pandas (McKinney, 2010) for data processing, NumPy for transformations (Harris *et al.*, 2020), statsmodels for estimation (Seabold & Perktold, 2010), and SciPy for descriptive statistics (Virtanen *et al.*, 2020).

Results and discussion

Descriptive Statistics

Table 2 illustrates how companies manage costs efficiently in relation to their sales growth. In the case of large-cap companies, we notice that the mean sales increase (0.0899) is higher than the mean cost increase (0.0859). As the sales are growing faster than the costs, this indicates that large-cap companies benefit from operating leverage and expanding margins (Goddard *et al.*, 2005). However, for mid-cap companies, we observe that sales and cost growth are almost identical (0.0859 and 0.0850, respectively). This indicates that for every unit of sales growth, mid-cap companies require an almost equivalent increase in costs, suggesting tighter margins. It is also observed that these companies have higher growth rates, higher profitability, and lower leverage than their counterparts. This suggests that mid-cap companies focus heavily on investing funds from internal sources and utilise them productively to generate considerable revenue. Compared to large- and mid-cap companies, we observe higher sales growth (0.0957) and cost growth (0.0888) in small-cap companies. Here, the higher sales growth rate than cost growth indicates that small-cap companies are scaling up revenue during their rapid expansion phases. Despite this fact, small-cap companies were found to be the least profitable and have the lowest value compared to mid-cap and large-cap companies, due to the absence of economies of scale during rapid expansions and high leverage risk (Ibhagui & Olokoyo, 2018).

From a risk perspective, given the standard deviations of sales (0.3061) and cost (0.2772), small-cap companies are the riskiest, reflecting their more volatile performance compared to large-cap companies. We also noticed that, while the average small-cap company grows rapidly, the data is heavily skewed, with some companies experiencing significant drops in sales and costs. This reveals that the downside risk is significantly greater than the upside potential, indicating a more idiosyncratic risk profile in small-cap companies. The mean age of large-, mid-, and small-cap companies is similar, indicating that despite their size differences, their maturity levels are comparable. The highest mean firm value (26.1090) is observed for large-cap companies. But such a high average is driven by a few companies, as indicated by the standard deviation (24.0194) and skewness (3.9064). The higher kurtosis for small-cap companies (4.7538) compared to large-cap companies (2.9799) reflects more extreme leverage positions.

Table 2. Descriptive Statistics

Group	Statistic	d_In_Cost	d_In_Sales	Profitability	Value	Age	Size	Growth	Leverage
Large-cap Companies	Count	370	370	370	370	370	370	370	370
	Mean	0.0859	0.0899	0.0771	26.1090	3.7461	10.5518	0.1026	0.4516
	Median	0.0872	0.0993	0.0653	19.1600	3.7136	10.5459	0.0893	0.2800
	Mode	-1.1852	-1.1768	-0.0433	0.0000	3.6109	7.6415	-0.4523	0.0100
	Std Dev	0.2412	0.2145	0.0517	24.0194	0.5013	1.2843	0.1360	0.4992
	Skewness	-0.6304	-1.0606	0.7479	3.9064	-0.0677	0.2552	2.6570	1.7323
	Kurtosis	6.1421	6.0453	0.4353	30.4747	0.2443	-0.4906	15.8709	2.9799
Mid-cap Companies	Count	290	290	290	290	290	290	290	290
	Mean	0.0850	0.0859	0.0944	23.6431	3.6876	9.2502	0.1125	0.3378
	Median	0.0902	0.0819	0.0784	18.4950	3.6636	9.4102	0.1001	0.1950
	Mode	-1.0767	-1.2963	-0.0579	4.8200	3.4340	6.8022	-0.3961	0.0100
	Std Dev	0.2268	0.2408	0.0655	19.9623	0.4490	1.0959	0.1176	0.3725
	Skewness	-0.6473	-0.2939	0.9200	2.5308	0.1267	0.0253	0.9340	1.8403
	Kurtosis	3.4779	6.4215	0.9687	10.8405	0.9359	-0.2332	5.3489	3.9434
Small-cap Companies	Count	309	309	309	309	309	309	309	309
	Mean	0.0888	0.0957	0.0633	17.0246	3.6437	8.3981	0.1121	0.5509
	Median	0.0895	0.0936	0.0522	13.0400	3.6109	8.4498	0.0961	0.4000
	Mode	-2.6750	-2.6776	-0.0984	6.6100	3.5553	5.6506	-0.4485	0.3700
	Std Dev	0.2772	0.3061	0.0485	16.3151	0.4656	0.9168	0.1478	0.5269
	Skewness	-3.3638	-2.9585	0.9522	4.8006	0.1811	-0.3007	1.5436	1.8906
	Kurtosis	33.7483	32.0275	2.3480	34.6842	0.1301	-0.0617	7.1489	4.7538

Source(s): Authors' own work

Correlation Analysis

We observe that across large-cap, mid-cap, and small-cap companies, the relationship between cost growth and sales growth is strongly positive (0.8778, 0.9228, and 0.9136, respectively) and statistically significant at the 1% level. This supports the fundamental economic assumption that sales are the primary drivers of costs. However, we cannot eliminate the cost stickiness behaviour as the relationship was not perfect. Such variation reflects the role of management decisions.

The moderate negative relationship between profitability and leverage across large-, mid-, and small-cap companies (-0.4446, -0.4558, and -0.4937, respectively) suggests that higher profitability is associated with lower debt. These findings confirm the Pecking Order Theory (Myers & Majluf, 1984), which implies that the profitable companies preferred to utilise internal sources of finance rather than external debt.

A highly significant positive relationship exists between size and leverage in large-cap and mid-cap companies (0.3839 and 0.4341, respectively), compared to small-cap companies (0.1354). This suggests that larger companies tend to have higher leverage because they have greater access to credit markets due to their greater collateral capacity. In contrast, a more significant negative relationship between size and value is observed in large-cap and mid-cap companies (-0.3362 and -0.3950, respectively), compared to small-cap companies (-0.1290), indicating lower valuation metrics for larger companies due to diminishing returns to scale.

The correlation matrix in Table 3 also provides preliminary insights into multicollinearity assessment. The results reveal a relationship between the independent variables, that is, firm characteristics, of less than 0.70, indicating the absence of severe multicollinearity in the data. This will also be confirmed using variance inflation factor calculations in Table 4.

Table 3. Correlation Matrix

Group	Variables	d_In_Cost	d_In_Sales	Profitability	Value	Age	Size	Growth	Leverage
Large-cap Companies	d_In_Cost	1							
	d_In_Sales	0.8778***	1						
	Profitability	0.0396	0.1172**	1					
	Value	0.0391	0.0513	-0.0367	1				
	Age	0.0371	0.0442	-0.1814***	-0.0891*	1			
	Size	0.0010	-0.0099	-0.3109***	-0.3362***	0.1799***	1		
	Growth	0.2557***	0.3096***	0.1118**	0.1001*	-0.0301	-0.0997*	1	
	Leverage	0.0209	0.0087	-0.4446***	-0.1557***	-0.1071**	0.3839***	-0.1081**	1
Mid-cap Companies	d_In_Cost	1							
	d_In_Sales	0.9228***	1						
	Profitability	0.1463**	0.1804***	1					
	Value	-0.0719	-0.1136*	0.0410	1				
	Age	-0.0102	-0.0108	-0.0689	-0.1549***	1			
	Size	-0.0854	-0.0868	-0.4357***	-0.3950***	0.2951***	1		
	Growth	0.1373**	0.1794***	-0.0280	0.1774***	-0.0321	-0.1502**	1	
	Leverage	0.0122	0.0165	-0.4558***	-0.1937***	-0.0637	0.4341***	0.0213	1
Small-cap Companies	d_In_Cost	1							
	d_In_Sales	0.9136***	1						
	Profitability	0.1588***	0.1998***	1					
	Value	-0.1393**	-0.1646***	-0.1317**	1				
	Age	-0.1676***	-0.1247**	0.1806***	0.0600	1			
	Size	-0.0928	-0.0765	-0.1677***	-0.1290**	0.2603***	1		
	Growth	0.2168***	0.2280***	0.0724	0.2206***	-0.0738	-0.0598	1	
	Leverage	-0.0349	-0.0425	-0.4937***	-0.0424	-0.1741***	0.1354**	0.0080	1

Source(s): Authors' own work

Note(s): ***1% level of significance, **5% level of significance, *10% level of significance

Multicollinearity Assessment

The variance inflation factors for the independent variables in the model are presented in Table 4. As highlighted in the methodology, we use grand-mean centring to compute the variables, and these variables are subsequently included in the main model. The computed VIFs are well below 5, indicating no severe multicollinearity among the independent variables. This suggests that the coefficient and statistics reported in the main model are reliable and not affected by redundant variables.

Table 4. Results of Variance Inflation Factor

Variable	VIF – Large-cap Companies	VIF – Mid-cap Companies	VIF – Small-cap Companies
d_In_Sales	2.3114	2.1224	1.7145
D	1.9602	1.9685	1.5165
Profitability_Centered	1.4984	1.5873	1.5776
Value_Centered	1.3711	1.7320	1.4672
Age_Centered	1.1678	1.1647	1.2134
Size_Centered	1.6480	2.4966	1.4940
Growth_Centered	1.1854	1.1397	1.1765
Leverage_Centered	1.5479	1.5998	1.4493
Year_2017	1.8527	1.8251	1.8121
Year_2018	1.9001	1.8951	1.8411
Year_2019	1.9332	1.9475	1.8643
Year_2020	1.8382	1.8580	1.8597
Year_2021	1.8974	2.0568	1.9229
Year_2022	2.1490	2.3867	2.0678
Year_2023	2.1054	2.0687	2.0633
Year_2024	2.0245	2.2064	2.1596
Year_2025	2.0089	2.3015	2.3480

Source(s): Authors' own work

Weiss Model – Large Cap Companies

Table 5 illustrates the impact of firm characteristics on the degree of cost asymmetry when sales change, for large-cap companies. With R-squared values ranging from 77.7% to 78.6%, the model provides a strong statistical fit across all specifications. The interaction term representing profitability, with a coefficient of 4.7097, is significant at the 1% level. The results indicate that profitability significantly moderates cost behaviour, with stronger cost responses to declines as profitability increases. This suggests that aggressive cost management and high operational flexibility are key drivers of profitability for these companies. This means that managers prioritise maintaining current profitability and, during downturns, are primarily driven by pressures on operational performance rather than structural constraints. This substantiates the fact that large firms emphasise demonstrating consistent profitability through tight internal cost control to provide quality disclosures, maintain stakeholder confidence and ensure overall growth (Pujiati *et al.*, 2022; Rezaee & Safarzadeh, 2023).

The other firm characteristics, namely: value, age, size, growth, and leverage, did not provide statistical evidence of influencing cost stickiness in large-cap companies. The small size and age imply that both new and older large-cap companies manage cost downturns similarly. Insignificant leverage suggests that debt levels do not constrain managers to reduce costs differently when sales decline.

Table 5. Results of Weiss Model - Large-cap Companies

Firm Characteristics (Z)	Profitability	Value	Age	Size	Growth	Leverage
$\Delta \ln(\text{Sales})$	0.9957***	1.0324***	1.0292***	1.0223***	1.0409***	1.0176***
	(13.72)	(11.05)	(12.58)	(11.67)	(9.26)	(10.54)
D	0.0023	-0.0042	-0.0012	-0.0024	-0.0033	-0.0061
	(0.20)	(-0.30)	(-0.09)	(-0.18)	(-0.19)	(-0.46)
$D \times \Delta \ln(\text{Sales})$	0.2079**	-0.0767	-0.0540	-0.0317	-0.0701	-0.0413
	(2.05)	(-0.97)	(-0.82)	(-0.49)	(-1.01)	(-0.63)
$Z \times \Delta \ln(\text{Sales})$	-0.6763	-0.0014	-0.1159	0.0289	-0.1276	-0.0097
	(-0.62)	(-0.86)	(-1.09)	(1.02)	(-0.54)	(-0.11)
$Z \times D \times \Delta \ln(\text{Sales})$	4.7097***	0.0009	-0.0378	0.0453	0.2476	-0.3305
	(3.77)	(0.22)	(-0.48)	(1.17)	(0.45)	(-1.20)
Z (Profitability)	-0.1561					
	(-1.49)					
Z (Value)		-0.0001				
		(-0.21)				
Z (Age)			0.0069			
			(0.71)			
Z (Size)				0.0015		
				(0.51)		
Z (Growth)					-0.0146	
					(-0.25)	
Z (Leverage)						0.0003
						(0.02)
R-Squared	0.7861	0.7771	0.7797	0.7790	0.7769	0.7782

Source(s): Authors' own work

Note(s): Values in the table represent the Coefficients. Values in () reflect t-statistic. ***1% level of significance, **5% level of significance, *10% level of significance

Weiss Model – Mid-cap Companies

The impact of firm characteristics on cost behaviour during sales fluctuations in mid-cap companies is highlighted in Table 6. The developed models exhibit a good statistical fit, as demonstrated by R-squared values ranging from 86.9% to 88.4%. For mid-cap companies, the significant interaction terms are related to growth and age, with coefficients of 0.8369 (significant at the 1% level) and -0.5031 (significant at the 10% level). The positive coefficient in the growth case indicates anti-stickiness. This indicates the cost sensitivity of high-growth mid-cap companies to a drop in sales. In other words, these companies sharply reduce their costs when sales decline. However, the negative age coefficient indicates stickiness. This indicates that older companies are often reluctant to reduce costs during downturns, often due to long-term commitments or rigid bureaucratic structures.

Unlike large-cap companies, profitability is not a significant factor in determining the cost stickiness of mid-cap companies. Similarly, neither the size nor the leverage reflects a significant impact on cost stickiness. Thus, we observe that cost management behaviour in mid-cap companies is predominantly influenced by age and growth, whereas profitability is the main driver in large-cap companies. These results suggest that young mid-cap companies forego idle resources during slack periods, in an attempt to grow and reach the minimum efficient scale of operation (Gimeno *et al.*, 1997; Stam & Wennberg, 2009).

Table 6. Results of Weiss Model - Mid-cap Companies

Firm Characteristics (Z)	Profitability	Value	Age	Size	Growth	Leverage
$\Delta \ln(\text{Sales})$	0.7290***	0.7264***	0.7553***	0.7199***	0.7974***	0.7033***
	(6.52)	(6.57)	(10.86)	(7.33)	(11.73)	(5.41)
D	-0.0590*	-0.0561*	-0.0569**	-0.0683**	-0.0453*	-0.0624*
	(-1.95)	(-1.92)	(-2.10)	(-2.06)	(-1.78)	(-1.95)
$D \times \Delta \ln(\text{Sales})$	0.1763	0.1712	0.0954	0.1096	0.0810	0.1948
	(0.90)	(1.13)	(1.04)	(0.89)	(1.07)	(1.27)
$Z \times \Delta \ln(\text{Sales})$	0.4515	-0.0014	0.2320	-0.0820	-	0.0448
	(0.51)	(-0.31)	(1.60)	(-1.21)	0.9548***	(0.53)
$Z \times D \times \Delta \ln(\text{Sales})$	-0.0648	0.0010	-0.5031*	0.1779	0.8369***	-0.2252
	(-0.03)	(0.21)	(-1.79)	(1.11)	(2.67)	(-1.49)
Z (Profitability)	-0.1744*					
	(-1.65)					
Z (Value)		0.0005				
		(0.92)				
Z (Age)			-0.0447			
			(-1.45)			
Z (Size)				0.0146		
				(1.40)		
Z (Growth)					0.1185***	
					(3.45)	
Z (Leverage)						-0.0019
						(-0.16)
R-Squared	0.8695	0.8695	0.8727	0.8712	0.8840	0.8711

Source(s): Authors' own work

Note(s): Values in the table represent the Coefficients. Values in () reflect t-statistic. ***1% level of significance, **5% level of significance, *10% level of significance

Weiss Model – Small-cap Companies

Table 7 highlights the impact of firm characteristics on cost behaviour among small-cap companies. The models demonstrate a strong statistical fit, as indicated by R-squared values ranging from 85.4% to 94.7% across various specifications. We observe a positive interaction with profitability, with a coefficient of 3.3075, significant at the 1% level. Additionally, we find growth, with a coefficient of 2.9214, significant at the 5% level, and age, with a coefficient of 0.3175, significant at the 5% level. This suggests that profitability, age, and growth are major drivers of anti-sticky cost behaviour among small-cap companies. This indicates that small-cap companies proactively reduce costs when sales decline to protect margins and support future growth. Furthermore, older small-cap companies are more aggressive in reducing costs than their younger counterparts.

However, the interaction term leverage, with a coefficient of -0.0664, significant at the 5% level, demonstrates sticky cost behaviour. The results did not reveal a significant influence of value and size on the cost behaviour of small-cap companies. The overall results indicate that small-cap companies, particularly older ones, base their cost-control decisions on achieving sales targets to demonstrate stable profitability and growth intentions to their stakeholders (Steffens et al., 2009). On the other hand, highly

leveraged small-cap companies have fixed financing costs and thus exhibit asymmetry in their cost management (Rao et al., 2019).

Table 7. Results of Weiss Model - Small-cap Companies

Firm Characteristics (Z)	Profitability	Value	Age	Size	Growth	Leverage
$\Delta \ln(\text{Sales})$	0.7890***	0.7921***	0.7652***	0.7627***	0.7085***	0.9339***
	(12.89)	(11.63)	(6.72)	(7.79)	(4.49)	(22.02)
D	0.0066	0.0065	-	-0.0771*	-0.0714*	0.0130
	(0.48)	(0.61)	0.0650***	(-2.74)	(-1.66)	(1.52)
$D \times \Delta \ln(\text{Sales})$	0.6147***	0.5344***	-0.0910	-0.0781	0.2491	0.2343***
	(5.24)	(2.94)	(-1.20)	(-0.54)	(1.57)	(4.85)
$Z \times \Delta \ln(\text{Sales})$	2.1524***	-0.0094	0.1416	-	0.1486	-
	(3.09)	(-1.48)	(0.85)	0.1552***	(1.14)	0.2096***
$Z \times D \times \Delta \ln(\text{Sales})$	3.3075***	-0.0013	0.3175**	0.3377	2.9214**	-0.0664**
	(4.06)	(-0.25)	(2.08)	(1.27)	(2.31)	(-2.16)
Z (Profitability)	-0.5886***					
	(-3.89)					
Z (Value)		0.0003				
		(0.29)				
Z (Age)			-0.0052			
			(-0.25)			
Z (Size)				0.0226**		
				(2.22)		
Z (Growth)					0.0815	
					(1.33)	
Z (Leverage)						0.0131
						(1.25)
R-Squared	0.9373	0.8937	0.9183	0.8542	0.8816	0.9474

Source(s): Authors' own work

Note(s): Values in the table represent the Coefficients. Values in () reflect t-statistic. ***1% level of significance, **5% level of significance, *10% level of significance

Based on the empirical evidence across the three market segments, we find strong support for our primary hypothesis (*H1*). The regression outputs clearly demonstrate that the firm-specific drivers of cost stickiness are highly heterogeneous and dependent on market capitalization. While profitability emerges as the sole significant driver of cost behaviour in large-cap companies, mid-cap firms are dictated primarily by lifecycle variables, specifically growth and age. Furthermore, small-cap firms exhibit a complex dynamic where managers attempt aggressive cost reductions but are significantly constrained by high leverage. Collectively, these distinct variations confirm that a firm's operational scale fundamentally alters how its internal characteristics impact resource commitment decisions, thereby supporting *H1*.

Robustness – Anderson Model

We use the Anderson *et al.* (2003) model to validate the findings of the modified Weiss (2010) model as presented in Table 8. The Anderson model tests for cost stickiness at the aggregate level, whereas the Weiss model isolates specific firm characteristics. The model tests the relationship between cost changes and sales changes, focusing on the stickiness of sales, using a dummy variable interaction for sales decreases.

The results did not indicate significant cost stickiness at the aggregate level for large-cap, mid-cap, and small-cap companies. Also, the coefficients for the interaction terms were found to be statistically insignificant. The insignificance of the aggregate Anderson model suggests that cost stickiness is not an inherent, universal trait of these firms, but rather a conditional phenomenon activated only when specific firm-level thresholds such as profitability or leverage are reached. This confirms the significance of Weiss (2010) model, which shows the cost behaviour being driven by specific firm characteristics.

Table 8. Results of Anderson Model

Variables	Large-cap Companies			Mid-cap Companies			Small-cap Companies		
	Coef.	z	P> z	Coef.	z	P> z	Coef.	z	P> z
const	-0.0183	-1.4333	0.1518	0.0509	2.1148	0.0344	0.0305	1.3276	0.1843
d_In_Sales	1.0154	11.5067	0.0000	0.7235	7.1846	0.0000	0.7424	5.2433	0.0000
D	-0.0058	-0.3994	0.6896	-0.0615	-2.0758	0.0379	-0.0691	-1.3485	0.1775
Interaction	-0.0589	-0.8748	0.3817	0.1381	1.1233	0.2613	0.0382	0.2030	0.8391
Year_2017	0.0219	1.5832	0.1134	-0.0218	-1.4007	0.1613	0.0024	0.1866	0.8519
Year_2018	0.0316	1.3925	0.1638	0.0013	0.0796	0.9365	0.0017	0.0822	0.9345
Year_2019	-0.0058	-0.3510	0.7256	-0.0047	-0.3197	0.7492	0.0323	1.6304	0.1030
Year_2020	-0.0081	-0.3287	0.7424	-0.0222	-1.3419	0.1796	0.0102	0.7360	0.4618
Year_2021	0.0405	1.5875	0.1124	-0.0230	-1.5426	0.1229	0.0149	0.4821	0.6297
Year_2022	0.0103	0.3573	0.7209	0.0320	1.2718	0.2034	0.0071	0.3540	0.7234
Year_2023	-0.0089	-0.2320	0.8165	-0.0155	-0.6880	0.4914	0.0368	1.4492	0.1473
Year_2024	0.0303	1.0550	0.2914	-0.0071	-0.2904	0.7715	-0.0368	-1.4591	0.1445
Year_2025	0.0082	0.7192	0.4720	-0.0051	-0.3383	0.7351	0.0040	0.2303	0.8179
R-squared	0.7759			0.8680			0.8472		

Source(s): Authors' own work

Conclusions

This study explored the cost stickiness behaviour of companies categorised as Large, Mid, and Small-cap using the Weiss (2010) model to identify firm-specific characteristics, with the Anderson *et al.* (2003) model as a robustness check. Overall, the analysis reveals a clear progression in cost management as companies grow. Ultimately, cost stickiness emerges as a strategic choice driven primarily by profitability in large-cap companies, lifecycle stages in mid-caps, and financial constraints in small caps.

Small companies display the most complex behaviour. Their cost decisions are influenced heavily by profitability, growth, age, and leverage as managers constantly balance expansion needs against margin maintenance and debt constraints. In mid-cap companies, this complexity decreases as financial constraints become less critical. Here, cost behaviour depends heavily on the lifecycle stage: young firms show aggressive cost-cutting, while mature firms tend to retain resources. For large companies, structural factors no longer distinctly drive cost behaviour; instead, profitability acts as the primary indicator of high operational discipline.

The empirical results further support these dynamics. The Weiss model showed positive interaction coefficients for profitability in large and small-cap companies, and for growth in mid- and small-cap companies. This points to anti-sticky behaviour, indicating that managers engage in aggressive cost reduction to prioritise short-term margin protection over long-term resource retention. The notable exceptions were leverage for small caps and age in mid-caps, both of which constrained aggressive cost reduction.

These findings provide distinct takeaways for market participants. For managers, particularly in mid-cap and small-cap firms, the results highlight the need to review resource commitments regularly to prevent rigid cost structures. Investors should exercise caution when evaluating young mid-cap and small-cap firms due to their specific leverage risks. Additionally, financial analysts should move away from simple linear models and instead use frameworks like the Weiss and Anderson models to accurately capture asymmetric cost behaviour.

A limitation of this study is that the previous year's cost behaviour may not be accurately reflected in the Weiss model due to slow cost adjustments. Future research could address this by employing a dynamic panel model to account for lagged cost behaviour, thereby enhancing the Weiss (2010) model by distinguishing real stickiness from simple carry-over effects.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process:

During the preparation of this work the author(s) used Paperpal (<https://paperpal.com/>) as a tool for English language editing and proofreading to enhance the grammar, clarity, and overall readability of the manuscript. Python code implementation was assisted by Anthropic's Claude AI, with all outputs manually verified by the authors. The supporting data and Python codes can be obtained from the authors upon request. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

Data availability statement

The data supporting this study's findings are available from the corresponding author upon request. *Funding:* This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest disclosure: The authors declare no conflict of interest.

References

- Abu-serdaneh, J. (2014). The Asymmetrical Behavior of Cost : Evidence from Jordan. *International Business Research*, 7(8), 113–122. <https://doi.org/10.5539/ibr.v7n8p113>
- Anderson, M. C., Banker, R. D., & Janakiraman, S. N. (2003). Are Selling, General, and Administrative Costs “Sticky”? *Journal of Accounting Research*, 41(1), 47–63. <https://doi.org/10.1111/1475-679X.00095>
- Balakrishnan, R., Petersen, M., & Soderstrom, N. S. (2004). Does Capacity Utilization Affect the “Stickiness” of Cost ? *Journal of Accounting, Auditing & Finance*, 19, 283–300. <https://doi.org/10.1177/0148558X0401900303>
- Ballas, A., Naoum, V., & Vlismas, O. (2022). The Effect of Strategy on the Asymmetric Cost Behavior of SG&A Expenses. *European Accounting Review*, 31(2), 409–447. <https://doi.org/10.1080/09638180.2020.1813601>
- Banker, R. D., & Byzalov, D. (2014). Asymmetric Cost Behavior. *Journal of Management Accounting Research*, 26(2), 43–79. <https://doi.org/10.2308/jmar-50846>

- Banker, R. D., Byzalov, D., & Chen, L. (2013). Employment protection legislation, adjustment costs and cross-country differences in cost behavior. *Journal of Accounting and Economics*, 55, 111–127. <https://doi.org/10.1016/j.jacceco.2012.08.003>
- Banker, R., Flasher, R., & Zhang, D. (2025). Strategic positioning and asymmetric cost behavior. *Asian Review of Accounting*, 33(1), 89–106. <https://doi.org/10.1108/ARA-12-2023-0347>
- Calleja, K., Steliaros, M., & Thomas, D. C. (2006). A note on cost stickiness : Some international comparisons. *Management Accounting Research*, 17, 127–140. <https://doi.org/10.1016/j.mar.2006.02.001>
- Chen, C. X., Lu, H., & Sougiannis, T. (2012). The Agency Problem, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Contemporary Accounting Research*, 29(1), 252–282. <https://doi.org/10.1111/j.1911-3846.2011.01094.x>
- Chen, L., Huang, J., Hu, D., & Chen, X. (2022). Dividend regulation and cost stickiness: evidence from a quasi-natural experiment. *China Accounting and Finance Review*, 24(4), 486–515. <https://doi.org/10.1108/CAFR-08-2022-0092>
- Chen, Y., & Xu, J. (2023). Digital transformation and firm cost stickiness: Evidence from China. *Finance Research Letters*, 52, 1–10. <https://doi.org/10.1016/j.frl.2022.103510>
- Cheung, J., Kim, H., Kim, S., & Huang, R. (2016). Is the asymmetric cost behavior affected by competition factors? *Asia-Pacific Journal of Accounting & Economics*, 25(1–2), 218–234. <https://doi.org/10.1080/16081625.2016.1266271>
- Ciftci, M., Mashruwala, R., & Weiss, D. (2016). Implications of Cost Behavior for Analysts' Earnings Forecasts. *Journal of Management Accounting Research*, 28(1), 57–80. <https://doi.org/10.2308/jmar-51073>
- Cameron, A., & Miller, D. L. (2015). A Practitioner's Guide to Cluster-Robust Inference. *Journal of Human Resources*, 50(2), 317–372. <https://doi.org/10.3368/jhr.50.2.317>
- Costa, M. D., & Habib, A. (2023). Cost stickiness and firm value. *Journal of Management Control* (Vol. 34). Springer Berlin Heidelberg. <https://doi.org/10.1007/s00187-023-00356-z>
- Costa, M. D., Habib, A., & Uddin, B. (2021). Financial constraints and asymmetric cost behavior. *Journal of Management Control*, 32. <https://doi.org/10.1007/s00187-021-00314-7>
- Dai, J., Hu, N., Huang, R., & Yan, Y. (2023). How does credit risk affect cost management strategies? Evidence on the initiation of credit default swap and sticky cost behavior. *Journal of Corporate Finance*, 80, 1–10. <https://doi.org/10.1016/j.jcorpfin.2023.102401>
- Datar, S. M., & Rajan, M. V. (2017). *Hornsgren's Cost Accounting: A Managerial Emphasis* (16th ed.). Pearson, Harlow, UK.
- Dierynck, B., Landsman, W., & Renders, A. (2012). Do Managerial Incentives Drive Cost Behavior? Evidence about the Role of the Zero Earnings Benchmark for Labor Cost Behavior in Belgian Private Firms. *SSRN Electronic Journal*. <https://doi.org/http://dx.doi.org/10.2139/ssrn.1458305>
- Fahmy, E. E., & Mohamed, K. A. S. (2025). The impact of cost stickiness on investment efficiency: the moderating role of financial reporting quality. *Journal of Financial Reporting and Accounting*. <https://doi.org/10.1108/JFRA-02-2025-0136>
- Gimeno, J., Folta, T., Cooper, A. C., & Woo, C. Y. (1997). Survival of the Fittest ? Entrepreneurial Human Capital and the Persistence of Underperforming Firms. *Administrative Science Quarterly*, 42(4), 750–783. <https://doi.org/10.2307/2393656>
- Goddard, J., Tavakoli, M., & Wilson, J. O. S. (2005). Determinants of profitability in European manufacturing and services: evidence from a dynamic panel model. *Applied Financial Economics*, 15(18), 1269–1282. <https://doi.org/10.1080/09603100500387139>

- Golden, J., Kohlbeck, M., & Rezaee, Z. (2020). Is Cost Stickiness Associated with Sustainability Factors? *Advances in Management Accounting*, 32, 35–73. <https://doi.org/10.1108/S1474-787120200000032002>
- Golden, J., Mashruwala, R., & Pevzner, M. (2020). Labor adjustment costs and asymmetric cost behavior: An extension. *Management Accounting Research*, 46. <https://doi.org/10.1016/j.mar.2019.07.004>
- Gormley, T. A., & Matsa, D. A. (2013). Common Errors: How to (and Not to) Control for Unobserved Heterogeneity. *The Review of Financial Studies*, 27(2), 617–661. <https://doi.org/10.1093/rfs/hht047>
- Guenther, T. W., & Riehl, A. (2014). Cost stickiness: state of the art of research and implications. *Journal of Management Control*, 24(4), 301–318. <https://doi.org/10.1007/s00187-013-0176-0>
- Habib, A., & Costa, M. D. (2020). Debt maturity structure and cost stickiness. *Journal of Corporate Accounting & Finance*, 32, 78–89. <https://doi.org/10.1002/jcaf.22479>
- Habib, A., & Hasan, M. M. (2016). Corporate Social Responsibility and Cost Stickiness. *Business & Society*, 58, 1–40. <https://doi.org/10.1177/0007650316677936>
- Harris, C. R., Millman, K. J., Walt, S. J. Van Der, Gommers, R., Virtanen, P., Cournapeau, D., Wieser, E., Taylor, J., Berg, S., Smith, N. J., Kern, R., Picus, M., Hoyer, S., Kerkwijk, M. H. Van, Brett, M., Haldane, A., Rio, J., Wiebe, M., Peterson, P., ... Oliphant, T. (2020). Array programming with NumPy. *Nature*, 585, 357–362. <https://doi.org/10.1038/s41586-020-2649-2>
- Hartlieb, S., & Loy, T. R. (2022). The impact of cost stickiness on financial reporting : evidence from income smoothing. *Accounting & Finance*, 62(3), 3913–3950. <https://doi.org/10.1111/acfi.12910>
- Hartlieb, S., Loy, T. R., & Eierle, B. (2020). Does community social capital affect asymmetric cost behaviour? *Management Accounting Research*, 46, 1–10. <https://doi.org/10.1016/j.mar.2019.02.002>
- Hosomi, S., & Ge, G. (2025). The Impact of Cost Stickiness on R&D Investment and Corporate Performance: An Empirical Analysis of Japanese Firms. *Journal of Risk and Financial Management*, 18(7), 1–27. <https://doi.org/10.3390/jrfm18070388>
- Iacobucci, D., Schneider, M. J., Popovich, D. L., & Bakamitsos, G. A. (2016). Mean centering helps alleviate “micro” but not “macro” multicollinearity. *Behavior Research Methods*, 48, 1308–1317. <https://doi.org/10.3758/s13428-015-0624-x>
- Ibhagui, O. W., & Olokoyo, F. O. (2018). Leverage and firm performance: New evidence on the role of firm size. *North American Journal of Economics and Finance*, 45, 57–82. <https://doi.org/10.1016/j.najef.2018.02.002>
- Ibrahim, A. E. A. (2015). Economic growth and cost stickiness: evidence from Egypt. *Journal of Financial Reporting and Accounting*, 13(1), 119–140. <https://doi.org/10.1108/JFRA-06-2014-0052>
- Ibrahim, A. E. A. (2018). Board characteristics and asymmetric cost behavior: evidence from Egypt. *Accounting Research Journal*, 31(2), 301–322. <https://doi.org/10.1108/ARJ-11-2015-0148>
- Ibrahim, A. E., Ali, H., & Aboelkheir, H. (2022). Cost stickiness : A systematic literature review of 27 years of research and a future research agenda. *Journal of International Accounting, Auditing and Taxation*, 46, 1–45. <https://doi.org/10.1016/j.intaccudtax.2021.100439>
- Kama, I., & Weiss, D. (2013). Do Earnings Targets and Managerial Incentives Affect Sticky Costs? *Journal of Accounting Research*, 51(1), 201–224. <https://doi.org/10.1111/j.1475-679X.2012.00471.x>
- Kim, J., Lee, J. J., & Park, J. C. (2022). Internal Control Weakness and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Journal of Accounting, Auditing & Finance*, 37(1), 259–292. <https://doi.org/10.1177/0148558X19868114>

- Kim, J. S., & Ra, K. (2022). Employee satisfaction and asymmetric cost behavior: Evidence from Glassdoor. *Economics Letters*, 219, 1–4. <https://doi.org/10.1016/j.econlet.2022.110829>
- Kim, J., & Zhou, J. (2023). Cost stickiness and bank loan contracting. *Advances in Accounting*, 61, 1–15. <https://doi.org/10.1016/j.adiac.2023.100645>
- Krisnadewi, K. A., & Soewarno, N. (2020). Competitiveness and cost behaviour: evidence from the retail industry. *Journal of Applied Accounting Research*, 21(1), 125–141. <https://doi.org/10.1108/JAAR-08-2018-0120>
- Lanen, W., Anderson, S., & Maher, M. (2022). *Fundamentals of Cost Accounting* (7th ed.). McGraw-Hill Education.
- Le, A., Phuong, T., & Cheng, T. F. (2022). Do female directors mitigate asymmetric cost behavior? Evidence from international data. *Finance Research Letters*, 49, 1–11. <https://doi.org/10.1016/j.frl.2022.103121>
- Li, T., Lu, C., & Chen, Z. (2023). The unintended consequence of collateral-based financing: Evidence from corporate cost behavior. *Journal of Contemporary Accounting & Economics*, 19(1), 1–25. <https://doi.org/10.1016/j.jcae.2022.100338>
- Li, T., Lu, C., & Xu, L. (2025). Access to finance and cost stickiness: Evidence from anti-recharacterization laws. *Advances in Accounting*, 68, 1–19. <https://doi.org/10.1016/j.adiac.2025.100816>
- Liang, S., Chen, D., & Hu, X. (2014). External auditor types and the cost stickiness of listed companies. *China Journal of Accounting Studies*, 2(4), 294–322. <https://doi.org/10.1080/21697213.2014.982004>
- Fourati, Y., & Chakroun Ghorbel, R. (2020). Sticky cost behavior and its implication on accounting conservatism: a cross-country study. *Journal of Financial Reporting and Accounting*, 18(1), 169–197. <https://doi.org/10.1108/JFRA-08-2018-0071>
- Mckinney, W. (2010). Data Structures for Statistical Computing in Python. *Proceedings of the 9th Python in Science Conference*, 56–61. <https://doi.org/10.25080/Majora-92bf1922-00a>
- Mohammadi, A., & Taherkhani, P. (2017). Organizational capital, intellectual capital and cost stickiness (evidence from Iran). *Journal of Intellectual Capital*, 18(3), 625–642. <https://doi.org/10.1108/JIC-06-2016-0066>
- Myers, S., & 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](https://doi.org/10.1016/0304-405X(84)90023-0)
- Naoum, V., Ntounis, D., Papanastasopoulos, G., & Vlismas, O. (2023). Asymmetric cost behavior: Theory, meta-analysis, and implications. *Journal of International Accounting, Auditing and Taxation*, 53, 1–36. <https://doi.org/10.1016/j.intaccaudtax.2023.100578>
- Naoum, V., Papanastasopoulos, G., Selekos, P., & Vlismas, O. (2024). Exploring the asymmetric cost behaviour in the context of European non-listed firms. *Applied Economics*, 56(31), 3778–3803. <https://doi.org/10.1080/00036846.2023.2208844>
- Noreen, E., & Soderstrom, N. (1997). The Accuracy of Proportional Cost Models: Evidence from Hospital Service Departments. *Review of Accounting Studies*, 2, 89–114. <https://doi.org/https://doi.org/10.1023/A:1018325711417>
- O'Brien, R. M. (2007). A Caution Regarding Rules of Thumb for Variance Inflation Factors. *Quality & Quantity*, 41, 673–690. <https://doi.org/10.1007/s11135-006-9018-6>
- Pan, Z., Zhang, G., & Zhang, H. (2022). Political uncertainty and cost stickiness: evidence from prefecture-city official turnover in China. *China Accounting and Finance Review*, 24(2), 142–171. <https://doi.org/10.1108/CAFR-02-2022-0007>

- Petersen, M. A. (2008). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *The Review of Financial Studies*, 22(1), 435–480. <https://doi.org/10.1093/rfs/hhn053>
- Prabowo, R., Hooghiemstra, R., & Van Veen-dirks, P. (2018). State Ownership, Socio-political Factors, and Labor Cost Stickiness. *European Accounting Review*, 27(4), 771–796. <https://doi.org/10.1080/09638180.2017.1329659>
- Pujiati, D., Supriyati, & Nita, R. A. (2022). Determinant of Earnings Quality: IFRS Convergence, Accounting Disclosure and Audit Committee in Indonesia. *International Journal of Finance & Banking Studies*, 11(1), 178–189. <https://doi.org/10.20525/ijfbs.v11i1.1520>
- Ra, K., & Kim, G. G. (2023). Does litigation risk matter for managers' asymmetric cost behavior? *Finance Research Letters*, 53, 1–7. <https://doi.org/10.1016/j.frl.2022.103619>
- Rao, P., Kumar, S., & Madhavan, V. (2019). A study on factors driving the capital structure decisions of small and medium enterprises (SMEs) in India. *IIMB Management Review*, 31, 37–50. <https://doi.org/10.1016/j.iimb.2018.08.010>
- Restuti, M. D., Gani, L., Shauki, E. R., & Leo, L. (2022). Strategy and cost stickiness under different managerial abilities: Evidence from Southeast Asia. *Cogent Business & Management*, 9(1), 1–16. <https://doi.org/10.1080/23311975.2022.2152530>
- Rezaee, Z., & Safarzadeh, M. H. (2023). Corporate governance and earnings quality: the behavioral theory of corporate governance (evidence from Iran). *Corporate Governance*, 23(1), 189–218. <https://doi.org/10.1108/CG-08-2021-0289>
- Salehi, M., Ziba, N., & Gah, A. D. (2018). The relationship between cost stickiness and financial reporting quality in Tehran Stock Exchange. *International Journal of Productivity and Performance Management*, 67(9), 1550–1565. <https://doi.org/10.1108/IJPPM-10-2017-0255>
- Seabold, S., & Perktold, J. (2010). Statsmodels: Econometric and Statistical Modeling with Python. *Proceedings of the 9th Python in Science Conference*, 92–96. <https://doi.org/10.25080/Majora-92bf1922-011>
- Stam, E., & Wennberg, K. (2009). The roles of R&D in new firm growth. *Small Business Economics*, 33, 77–89. <https://doi.org/10.1007/s11187-009-9183-9>
- Steffens, P., Davidsson, P., & Fitzsimmons, J. (2009). Performance Configurations Over Time: Implications for Growth- and Profit-Oriented Strategies. *Entrepreneurship Theory and Practice*, 33(1), 125–148. <https://doi.org/10.1111/j.1540-6520.2008.00283.x>
- Stimolo, M. I., & Porporato, M. (2020). How different cost behaviour is in emerging economies? Evidence from Argentina. *Journal of Accounting in Emerging Economies*, 10(1), 21–47. <https://doi.org/10.1108/JAEE-05-2018-0050>
- Subramaniam, C., & Weidenmier, M. (2016). Additional Evidence on the Sticky Behavior of Costs. *Advances in Management Accounting*, 27, 275–305. <https://doi.org/10.1108/S1474-787120150000026006>
- Tang, L., Huang, Y., Liu, J., & Wan, X. (2020). Cost Stickiness and Stock Price Crash Risk: Evidence from China. *Emerging Markets Finance and Trade*, 58(2), 544–569. <https://doi.org/https://doi.org/10.1080/1540496X.2020.1787148>
- Venieris, G., Naoum, V. C., & Vlismas, O. (2015). Organisation capital and sticky behaviour of selling, general and administrative expenses. *Management Accounting Research*, 26, 54–82. <https://doi.org/10.1016/j.mar.2014.10.003>
- Via, N. D., & Perego, P. (2014). Sticky cost behaviour : evidence from small and medium sized companies. *Accounting and Finance*, 54, 753–778. <https://doi.org/10.1111/acfi.12020>

- Villiers, C., Hay, D., & Zhang, Z. (2013). Audit fee stickiness. *Managerial Auditing Journal*, 29(1), 2–26. <https://doi.org/10.1108/MAJ-08-2013-0915>
- Virtanen, P., Gommers, R., Oliphant, T. E., Haberland, M., Reddy, T., Walt, S. J. Van Der, Brett, M., Wilson, J., Millman, K. J., Mayorov, N., Nelson, A., Jones, E., Kern, R., Larson, E., Carey, C., Polat, I., Feng, Y., Moore, E., VanderPlas, J., ... Mulbregt, P. (2020). SciPy 1.0: fundamental algorithms for scientific computing in Python. *Nature Methods*, 17, 261–272. <https://doi.org/10.1038/s41592-019-0686-2>
- Weiss, D. (2010). Cost Behavior and Analysts' Earnings Forecasts. *The Accounting Review*, 85(4), 1441–1471. <https://doi.org/10.2308/accr.2010.85.4.1441>
- Xu, J., & Sim, J. W. (2017). Are costs really sticky and biased ? Evidence from manufacturing listed companies in China. *Applied Economics*, 49(55), 5601–5613. <https://doi.org/10.1080/00036846.2017.1316823>
- Xu, S., & Zheng, K. (2018). Tax Avoidance and Asymmetric Cost Behavior. *Journal of Accounting, Auditing & Finance*, 35(4), 723–747. <https://doi.org/10.1177/0148558X18793757>
- Yang, G., Kuang, Y., & Li, B. (2020). Staying idle or investing in prevention: the short-term and long-term impact of cost stickiness on firm value. *China Journal of Accounting Studies*, 8(2), 298–329. <https://doi.org/10.1080/21697213.2020.1859251>
- Yang, Y., & Chen, D. (2023). Influence of COVID-19 on asymmetric cost behavior and intellectual capital efficiency: a comparison of Australian and Chinese listed firms. *Asia-Pacific Journal of Accounting & Economics*, 31(3), 447–493. <https://doi.org/10.1080/16081625.2023.2194887>
- Yasukata, K., & Kajiwara, T. (2011). Are “Sticky Costs” the Result of Deliberate Decision of Managers? *SSRN Electronic Journal*. <https://doi.org/https://ssrn.com/abstract=1444746>
- Zhang, L., Li, J., & Wang, H. (2019). IPO over-funding and cost stickiness. *Asia-Pacific Journal of Accounting & Economics*, 28(4), 411–426. <https://doi.org/10.1080/16081625.2019.1601024>
- Zisis, V., & Naoum, V. (2023). Sticky cost theory and firm's evolution. *Applied Economics Letters*, 30(3), 379–383. <https://doi.org/10.1080/13504851.2021.1988886>