International Journal of Advanced Research in Commerce, Management & Social Science (IJARCMSS)
(An International Quarterly Multidisciplinary Open Access Double Blind Peer Reviewed Refereed Journal)
ISSN :2581-7930 (Online), Impact Factor (Cosmos): 7.270 & PIF (I2OR): 5.010, Volume 09, No. 03(II), July-September, 2026, pp 189-195

Identification of Drivers for Financial Performance using Du Pont Analysis-A Study on Indian Textile Industry

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Citation: *Laha, S. & Samanta, P. (2026). Identification of Drivers for Financial Performance using Du Pont Analysis-A Study on Indian Textile Industry. International Journal of Advanced Research in Commerce, Management &Amp; Social Science, 09(03(II)), 189–195. https://doi.org/10.62823/IJARCMSS/9.3(II).9366*

Abstract

This study investigates the relative contribution of the three DuPont components — profit margin, asset turnover, and the equity multiplier — to Return on Equity (ROE), using a firm- and year-fixed-effects panel regression framework in the Indian textile industry. Drawing on a panel of firms observed over an extended multi-year period, with data sourced from Prowess and Bloomberg, the analysis controls for unobserved, time-invariant firm heterogeneity as well as common macroeconomic shocks by incorporating both firm and time fixed effects. The findings indicate that, among the three DuPont components, financial leverage, as captured by the equity multiplier, emerges as the only component with a statistically meaningful within-firm association with ROE, while profit margin and asset turnover do not show a comparable relationship. The model demonstrates strong explanatory power for within-firm variation in ROE. These results suggest that, within this sample, financial leverage is a more influential within-firm driver of ROE than operating profitability or asset-use efficiency. The study offers practical implications for analysts, investors, and managers, cautioning against interpreting a rising ROE as straightforward evidence of improved operating performance. Its primary contribution lies in applying a fixed-effects panel approach, rather than the simple or cross-sectional regressions common in prior DuPont literature, to isolate within-firm drivers of ROE.

Keywords: *DuPont Analysis, Return on Equity, Financial Leverage, Equity Multiplier, Panel Data, Fixed-Effects Regression.*

Introduction

Return on Equity (ROE) remains one of the most widely used summary measures of shareholder value creation, yet its aggregated form conceals the distinct economic forces that generate it. The DuPont framework addresses this limitation by decomposing ROE into three multiplicative components — profit margin, which captures operating profitability; asset turnover, which captures the efficiency with which assets are converted into sales; and the equity multiplier, which captures the degree of financial leverage employed by the firm. Because a given level of ROE can arise from very different combinations of these components, disaggregation is essential for distinguishing operationally driven performance from leverage-driven performance.

Much of the existing DuPont literature relies on descriptive ratio comparison or simple cross-sectional/pooled regression, which cannot separate the within-firm effect of a component from persistent, unobserved differences across firms (Bothra & Gupta, 2020; Doorasamy, 2016). A fixed-effects panel specification, which nets out time-invariant firm heterogeneity and common time shocks, offers a more credible basis for identifying which components move ROE within a given firm over time. This study

addresses that gap by estimating a firm- and year-fixed-effects panel regression of ROE on the three DuPont components for a sample of 169 firms observed over 1,515 firm-year observations.

Review of Literature

The theoretical starting point for the leverage component of the DuPont framework is Modigliani and Miller's (1958) capital structure theorem, which shows that, in frictionless markets, the value of a firm is independent of its financing mix, but that leverage mechanically raises the return earned on the equity portion of the firm's capital as long as the firm's return on assets exceeds its cost of debt. This mechanical amplification effect is the theoretical basis for expecting the equity multiplier to be positively associated with ROE, independent of any change in underlying operating performance.

On the accounting side, Fairfield and Yohn (2001) show that disaggregating return on assets into asset turnover and profit margin is not informative for forecasting the level of future profitability, but that disaggregating the change in these components is informative for forecasting changes in profitability — a finding that underscores the importance of within-firm, time-series variation (rather than cross-sectional levels) when evaluating the DuPont components, which is the identification strategy adopted in the present study.

Applied DuPont studies in specific industry contexts report mixed results on which component dominates. In an Indian setting, Bothra and Gupta (2020) compare luxury and non-luxury industry portfolios and report that the largest beta coefficient is contributed by asset turnover (efficiency) rather than by profit margin or leverage, in both the luxury and non-luxury samples — a finding that stands in contrast to the leverage-dominant pattern typically emphasised in capital-structure theory.

Research Gap

Taken together, this literature establishes that (a) the DuPont components need not contribute equally to ROE, (b) their relative importance appears to be industry- and context-dependent, and (c) most empirical DuPont studies do not control for firm-level fixed effects, so it remains unclear whether previously reported component effects reflect genuine within-firm relationships or simply persistent cross-sectional differences between firms. This constitutes the research gap addressed by the present study: applying a firm- and year-fixed-effects panel regression to isolate the within-firm association between each DuPont component and ROE.

Research Objectives

- To decompose ROE into its DuPont components.
- To estimate the within-firm association of each component with ROE using a fixed-effects panel model.
- To identify which component — profitability, efficiency, or leverage — dominates as a within-firm driver of ROE in this sample.

Theoretical Framework and Hypotheses

The DuPont identity expresses ROE as the product of three ratios: ROE = Profit Margin × Asset Turnover × Equity Multiplier, where Profit Margin = Net Income / Sales, Asset Turnover = Sales / Total Assets, and the Equity Multiplier = Total Assets / Total Equity. Because this identity is multiplicative rather than additive, the linear panel regression estimated here should be understood as an empirical approximation that tests whether each component is associated with ROE after controlling for the others, rather than as a literal restatement of the accounting identity.

Profit margin is expected to relate positively to ROE because, holding asset turnover and leverage constant, a firm that converts a larger share of sales into net income mechanically generates a higher return for a given level of equity. The equity multiplier is expected to relate positively to ROE because, consistent with Modigliani and Miller (1958), a higher proportion of debt financing amplifies the return earned on the smaller equity base, provided operating returns exceed the cost of debt.

H_{01}: Profit Margin has no significant relationship with ROE.
H_{11}: Profit margin is positively associated with ROE.
H_{02}: Asset Turnover has no significant relationship with ROE.
H_{12}: Asset turnover is positively associated with ROE.
H_{03}: Equity Multiplier has no significant relationship with ROE.
H_{13}: The equity multiplier is positively associated with ROE.

Research Methodology

- **Research Design**

The study adopts a quantitative, explanatory panel-data design intended to test the association between the three DuPont components and ROE while controlling for firm- and year-level heterogeneity.

- **Data Source and Study Period**

The research sample consists of 169 out of 211 Indian textile companies either listed in NSE or BSE or both. The period of the study is from 2010 TO 2020. Data for the study has been collected Prowess & Bloomberg data bases, other journals and annual reports issued by Ministry of Textiles, GOI.

- **Methodology**

The present study adopts a quantitative and empirical research design to examine the determinants of financial performance of selected firms in the Indian textile industry. Financial performance is evaluated using Return on Equity (ROE), while the explanatory variables are derived from the three components of the DuPont framework, namely Profit Margin, Asset Turnover and Equity Multiplier. The study employs statistical and econometric techniques to examine the individual and joint effects of these variables on ROE.

The methodology consists primarily of descriptive analysis, correlation analysis, multiple regression analysis and the F-test. These techniques are used to assess the nature, direction and statistical significance of the relationships between ROE and its principal DuPont components.

Tools and Techniques Used

Table 1: Tools

Sl. No.	Tool / Technique	Purpose / Application
1	Microsoft Excel	Data compilation, cleaning, classification and preliminary analysis
2	Descriptive Statistics	To analyse Mean, Median, Standard Deviation, Minimum and Maximum values
3	DuPont Analysis	To decompose ROE into Profit Margin, Asset Turnover and Equity Multiplier
4	Correlation Analysis	To examine the direction and strength of relationships among the variables
5	Multiple Regression Analysis	To examine the effect of Profit Margin, Asset Turnover and Equity Multiplier on ROE
6	Panel Data Analysis	To analyse observations relating to multiple firms over multiple years
7	Fixed Effects Model	To control for unobserved firm-specific and year-specific effects
8	t-Test	To test the statistical significance of individual regression coefficients
9	F-Test	To test the joint/overall significance of the regression model
10	R-Squared Analysis	To assess the explanatory power and goodness of fit of the regression model
11	p-Value Analysis	To determine the statistical significance of individual coefficients
12	Hypothesis Testing	To test the proposed hypotheses at the 1% significance level

Variable Specifications

Table 2: Variable Definitions

Variable	Type	Definition/Measurement	Expected Relationship with ROE
Return on Equity (ROE)	Dependent	Net income scaled by shareholders' equity (DuPont outcome variable)	—
Profit Margin (%)	Independent	Net income / Sales — measures operating profitability	Positive
Asset Turnover	Independent	Sales / Total assets — measures asset-use efficiency	Positive
Equity Multiplier	Independent	Total assets / Total equity — measures financial leverage	Positive
Firm fixed effects	Control	Firm-specific intercepts absorbing time-invariant heterogeneity	—
Year fixed effects	Control	Year-specific intercepts absorbing common macroeconomic shocks	—

- **Econometric Model**

A fixed-effects (within) panel regression is used to estimate the relationship between the DuPont components and ROE. Firm fixed effects control for unobserved, time-invariant firm characteristics (such as industry positioning or management quality) that could otherwise confound the estimated relationships, while year fixed effects control for common macroeconomic or market-wide shocks affecting all firms in a given year. The significant F-test for the firm fixed effects ($p < 0.001$) supports the inclusion of firm-level controls.

$$ROE_{it} = \beta_0 + \beta_1 (\text{Profit Margin})_{it} + \beta_2 (\text{Asset Turnover})_{it} + \beta_3 (\text{Equity Multiplier})_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where the subscript i indexes firms and t indexes years; μ_i denotes firm fixed effects; λ_t denotes year fixed effects; and ε_{it} is the idiosyncratic error term. The model is estimated using the within (fixed-effects) estimator, which removes both firm-specific and year-specific means from the data prior to estimation, so that the coefficients β_1, β_2, and β_3 are identified from within-firm, within-year deviations in the DuPont components rather than from cross-firm differences.

Results and Empirical Findings

- **Descriptive Statistics**

Table 3: Variable Definitions

Variables	Observations (N)	Mean	Standard Deviation (SD)	Minimum	Maximum
Return on Equity (%)	1,515	-0.69	545.54	-8,109.32	15,460.00
Profit Margin (%)	1,668	-36.54	512.39	-18,815.38	86.36
Asset Turnover	1,515	1.13	0.57	0.00	5.18
Equity Multiplier	1,555	29.12	61.59	0.01	1,680.70

- **Correlation Analysis**

Both Pearson (linear) and Spearman (rank-based, more robust to non-normal distributions common in financial ratios) correlations were computed, along with their statistical significance.

Table 4: Correlation Results

Variable Pair	Pearson r	p-value	Spearman ρ	p-value	Interpretation
Net Profit Margin ↔ Asset Turnover	0.106	0.0033	0.123	0.0007	Weak positive
Net Profit Margin ↔ Equity Multiplier	-0.067	0.0618	-0.336	<0.0001	Weak-to-moderate negative
Asset Turnover ↔ Equity Multiplier	0.025	0.4865	0.207	<0.0001	Weak positive

- **Multicollinearity Analysis**

Because Net Profit Margin, Asset Turnover, and Equity Multiplier are multiplied together in the DuPont identity to produce ROE, it is worth formally checking whether they are statistically redundant with one another (multicollinear) before treating them as separate explanatory levers. A Variance Inflation Factor (VIF) test was performed for each variable.

- **Variance Inflation Factor (VIF)**

VIF measures how much the variance of a variable is inflated because of its linear association with the other variables in the set. A VIF of 1.0 means a variable is completely uncorrelated with the others; values above 5–10 typically signal a multicollinearity problem.

Table 5: VIF Test Results

Variable	VIF	Tolerance (1/VIF)
Net Profit Margin	1.016	0.984
Asset Turnover	1.012	0.988
Equity Multiplier	1.006	0.994

All three VIF values are essentially at the theoretical minimum of 1.0 (1.006–1.016), with tolerance levels above 0.98 in every case. This confirms numerically what the correlation matrix already suggested: each variable carries almost entirely independent information.

Regression Results

Table 6: Fixed-Effects Panel Regression Results (Dependent Variable: ROE)

Variable	Coefficient	Std. Error
Profit Margin (%)	0.0139	(0.0209)
Asset Turnover	48.27	(32.21)
Equity Multiplier	6.714***	(0.235)
Constant	-249.6***	(37.85)

Model Statistic	Value
Observations	1,515
Number of firms	169
R-squared	0.381
Firm fixed effects	Yes
Year fixed effects	Yes
Within R-squared	0.381
Between R-squared	0.279
Overall R-squared	0.255
F-statistic	276.3

*** p < 0.01, ** p < 0.05, * p < 0.1.

The equity multiplier is the only DuPont component that is statistically significant at conventional levels. Its coefficient of 6.714 ($p < 0.01$) indicates that a one-unit within-firm increase in the equity multiplier is associated with an increase in ROE of approximately 6.7 percentage points, holding profit margin and asset turnover constant. Given the standard error of 0.235, this estimate is precise as well as statistically significant, and its magnitude is economically large relative to typical ROE ranges, indicating that the result is unlikely to be a statistical artefact of a very large sample alone.

Profit margin carries a small positive coefficient (0.0139) but is not statistically distinguishable from zero ($p = 0.504$; implied by the reported standard error of 0.0209 relative to the coefficient). This indicates that, once firm fixed effects are included, within-firm changes in net income relative to sales are not reliably associated with within-firm changes in ROE in this sample. Asset turnover carries a larger positive coefficient (48.27) but is likewise statistically insignificant ($p = 0.134$; standard error 32.21), indicating that within-firm changes in sales generated per unit of assets are not a statistically reliable driver of ROE either, notwithstanding the positive point estimate.

Hypothesis Testing

Table 7: Hypothesis Testing Summary

Hypothesis	Expected Relationship	Empirical Result	Decision	Interpretation
H11: Profit margin → ROE	Positive	$\beta = 0.0139$, $p = 0.504$	Not supported	No statistically reliable within-firm relationship
H12: Asset turnover → ROE	Positive	$\beta = 48.27$, $p = 0.134$	Not supported	Positive but statistically imprecise within-firm relationship
H13: Equity multiplier → ROE	Positive	$\beta = 6.714$, $p < 0.01$	Supported	Leverage is a strong, precisely estimated within-firm driver of ROE

Analysis

The data demonstrate that, within this panel, the equity multiplier is the only DuPont component with a statistically robust within-firm association with ROE, while profit margin and asset turnover are not. This pattern is consistent with the mechanical amplification effect described by Modigliani and Miller (1958): because ROE divides net income by a shrinking equity base as leverage rises, increases in the equity multiplier can raise ROE even without any improvement in underlying operating performance. The data cannot, however, establish that leverage causes higher ROE in a strict sense, since the panel

specification does not address the possibility that capital-structure choices are themselves endogenous to unobserved firm-level profitability shocks; the finding should therefore be read as a robust association rather than a causal claim.

This result diverges from Bothra and Gupta (2020), who find that asset turnover (efficiency) carries the largest coefficient in explaining ROE for both luxury and non-luxury industry portfolios in an Indian setting.

Conclusion

This study set out to identify which of the three DuPont components — profit margin, asset turnover, and the equity multiplier — drives within-firm variation in ROE, using a fixed-effects panel regression estimated on 1,515 firm-year observations from 169 firms. The equity multiplier emerges as the only statistically significant driver ($\beta = 6.714$, $p < 0.01$), while profit margin and asset turnover do not reach conventional significance thresholds once firm and year fixed effects are included. The model explains 38.1% of within-firm ROE variation. These findings support the theoretical expectation, grounded in Modigliani and Miller (1958), that financial leverage exerts a mechanical and economically material influence on ROE, and they suggest that this influence is more robust, at the within-firm level, than the influence of operating profitability or asset-use efficiency in this sample.

Implications for the Stakeholders

- **Managers:** Because leverage is a statistically stronger within-firm driver of ROE than margin or asset efficiency in this sample, managers should be cautious about using ROE alone as a signal of improving operational performance; a rising ROE that is not accompanied by an improving profit margin or asset turnover may instead reflect increased financial risk from higher leverage.
- **Investors:** Investors comparing firms or tracking a firm's ROE over time should decompose the metric into its DuPont components before drawing conclusions about the sustainability of returns, since the results indicate that ROE gains driven by leverage carry different risk implications than gains driven by margin or efficiency improvements.
- **Policymakers:** To the extent that reported ROE is used as an input into regulatory or disclosure frameworks, the finding that leverage — rather than operating performance — is the statistically dominant within-firm driver of ROE in this sample suggests value in encouraging or requiring supplementary disclosure of DuPont-style ratio decompositions alongside headline ROE figures.

Future Research

Future work could extend this analysis in several directions. Second, a Hausman test comparing fixed- and random-effects estimates, together with a pooled-OLS baseline, would clarify how much of the observed component significance depends on the choice of estimator.

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