

# Impact of Advertising and R&D on Profitability: Evidence from Indian Automobile Industry

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**Abstract:** The purpose of this study is to examine the effect of R&D intensity and advertising intensity on profitability of Indian automobile industry. For this purpose twenty five automobile players were selected and data on R&D expenditures, advertising, net profits and sales turnover were extracted from CMIE PROWESS for time period 1998-2014. The findings reveal that 17 firms exhibit significant association between advertising intensity and profitability and 16 firms between R&D intensity and profitability. The study suggests that to reap the benefit of R&D expenditures complex procedure of R&D investment and to obtaining license for new designs should be dismantled.

**Keywords:** Automobiles, Profitability, Structure, advertising, R&D

## I. Introduction

The traditional structure-conduct-performance model of industrial organization has assumed that the firms play a passive role in determination of market structure and market structure further influences the market or industry performance. But, in reality firms are active rather than passive and take decisions which can change the constraints under which they operate. Thus, market conduct takes a pivotal role in the analysis of industry or market performance. This study examines the effect of market conduct variables namely advertisement and research & development (R&D) on profitability of the Indian automobile industry. Markets conduct i.e. market strategies are concerned

with the creation of value for firms through effective differentiation of products and services. It is well known that advertisement and research & development (R&D) are the main components of market conduct (Chauvin and Hirschey, 1993: pp. 128-140; Rajapathirana and Hui, 2018: pp.44-55). The R&D brings new technologies, products and processes which create value for firms. On the other hand advertising further helps increasing productivity of R&D programs by creating consumer awareness, increasing product sales and customer loyalty.

Present study is an attempt to evaluate the causal relationship between markets conducts and market performance in Indian automobile industry with following specific objectives:

- To study the effect of advertising intensity on profitability
- To study the effect of R&D intensity on profitability

The whole study has been divided into five sections: First section presents introduction of the study. In section two, the review of literature has been discussed. The third section deals with database and methodology and also briefly explains variable & model specification that has been utilized in the study. Section four presents the empirical results and discussion. The last section concludes the study and provides policy implications, limitations of the study and scope for future research.

## II. Theoretical background and hypotheses

Previous research shows the R&D, advertising and profitability relationship in different industries across countries (Gupta, 1983: pp. 281-301, Hirschey and Weygandt, 1985: pp. 326-335, Lucius, *et. al*, 2008: pp. pp13). Archarunroj and Hoshino (1999: pp 71-86) studied the R&D, advertising and profitability relationship in Japanese chemical and pharmaceutical industry and found that the R&D expenditure and R&D intensity are positively related to the return on assets, return on equity, gross profit margin and operating income margin. Similarly, Leonard (1971: pp. 232-256) also identified positive relationship between R&D spending and growth rates of sales, assets and net income. Hirschey and Weygandt (1985: pp. 326-335) examined the relationship between conduct (advertising expenditure, R&D expenditures) and performance (market value of firm) variables during 1977 of three product group firms of U.S industry. They found that both

advertising expenditures and R&D expenditures have systematic influence on the market value of the firm. Lucius *et.al*, (2008: pp. 13) exhibits the impact of R&D intensity, advertising intensity on returns on assets (ROA) in the United States pharmaceutical industry. They found that R&D intensity was positively associated with Return on Equity (ROE), however, advertising intensity and ROA were not found to be significantly associated. Srinivasan and Lilien (2009: pp. 1-29) gauged into 3804 publicly listed US firms from 1969 to 2007 and found that increase in R&D expenditure lowered profits, whereas increases in advertising expenditure enhanced the profit. To investigate the linear relationship between R&D and advertising expenditure in Korean manufacturing, Kim and Choi (2013: pp. 195-202) analyzed 100 firms and found that advertising expenditure had a positive association with sales revenue which indicated profitability but, R&D expenditure had no such association with sales revenue during 2000-2011. Kumar and Kaur (2014: pp.245-252) also made an attempt to check association between advertising expenditures and firm's shares in Indian automobile industry. However, they identified negative relationship between advertising expenditures and firm's market share during 1992-2011. Mahendru and De (2014: pp.7-23) studied the linkages between advertising expenditure and profits (firm value) in by taking a sample of 100 FMCG companies in India for the period 2001-02 to 2010-11. They employed regression analysis to test the linkages and found that firm value influenced by advertising expenditures. Table 1 shows extent research on impact of advertising and R&D on firm performance.

**Table 1: Dependent and Independent Variables available in Literature**

Author	Independent	Dependent
Gupta (1983: pp.281-301)	R&D Intensity, Advertising Intensity	Price-Cost Margin
Hirschey and Weygandt (1985: pp 326-335)	Advertising Expenditure, R&D Expenditure	Sales Volume
Chauvin and Hirschey (1993: 128-140)	R&D and Advertising Expenditure	Value of Shares
Geroski, Machin and van Reenen (1993: 198-211)	R&D Intensity	Profit Margin
Leong, Ouliaris and Franke (1996: pp. 111-122)	Advertising Expenditure	Sales Volume
Archarungroj and Hoshino (1999: pp. 71-86)	R&D Expenditure	Return on Assets, Return on Equity, Gross Profit Margin and Operating Income Margin
Lucius, Giorgis and Lee (2008: pp. 13)	R&D Intensity, Advertising Intensity	Return on Equity, Return on Assets
Sharma and Sharma (2009: pp. 83-96)	Advertisement Expenses	Sales Revenue
Kim and Choi (2013: pp. 195-202)	Advertising Expenditure, R&D Expenditure	Sales Turnover
Mahendru and De (2014: pp. 7-23)	Advertising Expenditure	Sales Volume
Islam, Parvin and Datta (2014: pp. 162-167)	Advertising Expenditure	Sales Volume

Thus, on the basis of extant literature on R&D, Advertising and Profitability association, we propose following hypotheses:

H<sub>1</sub>: *Pr* is significantly determined by *AI*

H<sub>2</sub>: *Pr* is significantly determined by *RD*

$$Pr = \alpha + AI\beta + U \dots \dots \dots (1)$$

$$Pr = \alpha + RD\beta + U \dots \dots \dots (2)$$

Where, *Pr* is the ratio of net profit to total sales turnover

*AI*: Advertising intensity is defined as the ratio of advertising expenditure to the value of sales

*RD*: Ratio of Research and Development expenditure to total sales turnover

### III. Research Methodology

As per the requirement of the present study the data has been drawn from the PROWESS database developed by Centre for Monitoring Indian Economy (CMIE). Prowess is the most comprehensive source of industrial data; it gathers data from Audited Financial Reports, Stock Exchanges and other related sources (Sahu and Choutagunta, 2017: pp. 1-46). PROWESS classifies the Indian Industries into seven categories namely

- i. Automobile Industry
- ii. Cement Industry

- iii. Food Industry
- iv. Steel Industry
- v. Textile Industry
- vi. Pharmaceutical Industry
- vii. Information Technology Industry

From the above mentioned list of industries, we selected automobile industry and extracted data on R&D expenditures, advertisement expenditures, sales turnover and net-profit of 25 firms (refer Appendix), for the period 1998 - 2014. Data gathering was restricted to those firms which showed data on both the advertising expenditure and R&D expenditure and as a result only 25

firms could meet the search criterion. After extraction of data from PROWESS, we framed it in excel file format which was further used for statistical analysis with the help of E-views statistical software. As per the need of the study and nature of data, simple regression method has been employed for analysis.

#### IV. Results

In present section we employed regression analysis to test the hypotheses formed to investigate the advertising, R&D and profitability relationship in Indian automobile industry

**Table 2: Regression Results (Time-Series) Model (1)**

Company Name	N	Intercept	AI	R <sup>2</sup>	p – value
Ford India Pvt. Ltd	16	-9.082	2.473 (8.419) ***	0.835	0.000
General Motors India Pvt. Ltd	16	6.667	0.187 (0.634) <sup>NS</sup>	0.027	0.536
Hindustan Motors Ltd	17	0.032	1.248 (2.112) *	0.229	0.051
Honda Cars India Ltd	17	5.917	0.374 (1.712) ·	0.163	0.107
Hyundai Motor India Ltd	17	4.432	0.643 (5.812) ***	0.692	0.000
International Cars & Motors	10	4.636	0.166 (1.295) <sup>NS</sup>	0.173	0.231
Mahindra Reva Electric	6	3.294	0.667 (2.680) *	0.642	0.055
Maruti Suzuki India Ltd	17	2.903	0.879 (5.366) ***	0.657	0.000
Ashok Leyland Ltd	17	4.697	0.523 (4.673) ***	0.592	0.000

Asia Motor Works Ltd	10	2.146	0.725 (1.751)	0.277	0.117
Defence Land System	6	3.965	0.370 (0.683) <sup>NS</sup>	0.104	0.531
Force Motors Ltd	17	4.078	0.571 (2.418) *	0.280	0.028
S M L Isuzu Ltd	17	1.893	0.852 (5.626) ***	0.678	0.000
Tata Motors Ltd	17	4.429	0.658 (6.578) ***	0.742	0.000
V E Commercial Vehicles Ltd	7	-1.375	1.268 (10.784) ***	0.958	0.000
Atul Auto Ltd	17	3.301	0.660 (6.778) ***	0.753	0.000
Bajaj Auto Ltd	8	16.805	-0.800 (-1.513) <sup>NS</sup>	0.276	0.180
Eicher Motors Ltd	17	1.837	0.880 (6.321) ***	0.727	0.000
Hero Motocorp Ltd	17	-0.379	1.205 (13.531) ***	0.924	0.000
Kerala Automobiles Ltd	7	8.697	-1.501 (-0.912) <sup>NS</sup>	0.142	0.403
L M L Ltd	17	5.581	0.166 (0.540) <sup>NS</sup>	0.019	0.596
Mahindra Vehicle Mfrs.	7	2.343	0.749 (6.492) ***	0.893	0.001
Scooters India Ltd	17	3.514	0.363 (0.336) <sup>NS</sup>	0.007	0.740
T V S Motor Co. Ltd	17	-1.192	1.171 (7.716) ***	0.798	0.000
Yamaha Motor India Pvt. Ltd	13	10.982	-0.664 (-0.846) <sup>NS</sup>	0.061	0.415

Note: N- Number of Years; \*\*\*significant at p= 0.001level; \*\*significant at p= 0.01 level; \*significant at p=0.05 level; and Significant at p=0.10 level; Parentheses indicates t-values; NS- Non-Significant

Table 2 presents the results of model (1) where 'N' indicates the number of years of respective firm. It is observed that the results in case of 17 firms out of 25 firms are statistically significant, which means hypothesis ( $H_1$ ) is accepted i.e.  $Pr$  (ratio of net profit to total sales turnover) is significantly determined by  $AI$  (advertising intensity). Out of 17 firms the results in case of 12 firms (Ford India Pvt. Ltd, Hyundai Motor India Ltd, Maruti Suzuki India Ltd, Ashok Leyland Ltd, SML Isuzu Ltd, Tata Motors Ltd, VE Commercial Vehicles Ltd, Atul Auto Ltd, Eicher Motors Ltd, Hero Motocorp Ltd, Mahindra Vehicle Mfrs. and

TVS Motor Co. Ltd.) are significant at 0.1 per cent level, for 3 firms (Hindustan Motors Ltd, Mahindra Reva Electric and Force Motors Ltd) at 5 per cent level and for 2 firms (Honda Cars India Ltd. and Asia Motor Works Ltd.) at 10 per cent level. Thus, the majority of firms reveal positive relationship between advertising and profitability except General Motors India Pvt. Ltd, International Cars & Motors, Defence Land System, Bajaj Auto Ltd, Kerala Automobiles Ltd, L M L Ltd, Scooters India Ltd and Yamaha Motor India Pvt. Ltd.

**Table 3: Regression Results (Time-Series) Model (2)**

Company Name	N	Intercept	RD	R <sup>2</sup>	p – value
Ford India Pvt. Ltd	16	4.291	0.906 (7.996) ***	0.820	0.000
General Motors India Pvt. Ltd	16	4.424	4.424 (3.640) **	0.486	0.002
Hindustan Motors Ltd	17	5.314	0.482 (0.731) NS	0.034	0.475
Honda Cars India Ltd	17	8.598	-0.211 (-0.765) NS	0.037	0.455
Hyundai Motor India Ltd	17	8.441	0.336 (6.409) ***	0.732	0.000
International Cars & Motors	10	3.006	1.039 (5.459) ***	0.788	0.000
Mahindra Reva Electric	6	3.588	0.508 (2.523) NS	0.614	0.065
Maruti Suzuki India Ltd	17	7.690	0.451 (8.726) ***	0.835	0.000
Ashok Leyland Ltd	17	7.225	0.298 (5.538) ***	0.671	0.000
Asia Motor Works Ltd	10	6.381	-0.050 (-0.149) NS	0.002	0.884
Defence Land System	6	3.986	0.221 (0.454) NS	0.049	0.673
Force Motors Ltd	17	2.910	0.851	0.525	0.001

			(4.072) ***		
S M L Isuzu Ltd	17	5.856	0.292	0.488	0.001
			(3.785) ***		
Tata Motors Ltd	17	8.372	0.265	0.243	0.044
			(2.195) *		
V E Commercial Vehicles Ltd	7	0.278	1.312	0.849	0.003
			(5.319) **		
Atul Auto Ltd	17	5.171	0.513	0.801	0.006
			(4.488) **		
Bajaj Auto Ltd	8	2.757	1.069	0.613	0.021
			(3.088) *		
Eicher Motors Ltd	17	2.420	1.034	0.665	0.000
			(5.463) ***		
Hero Motocorp Ltd	17	4.138	1.071	0.840	0.000
			(8.882) ***		
Kerala Automobiles Ltd	7	4.077	-0.358	0.130	0.426
			(-0.866) <sup>NS</sup>		
L M L Ltd	17	6.571	-0.013	0.000	0.967
			(-0.040) <sup>NS</sup>		
Mahindra Vehicle Mfrs.	7	4.005	0.770	0.984	0.000
			(18.089) ***		
Scooters India Ltd	17	4.711	0.148	0.003	0.817
			(0.235) <sup>NS</sup>		
T V S Motor Co. Ltd	17	1.927	1.041	0.898	0.000
			(11.534) ***		
Yamaha Motor India Pvt. Ltd	13	4.710	0.382	0.242	0.087
			(1.875) <sup>NS</sup>		

Note: N- Number of Years; \*\*\*significant at p= 0.001 level; \*\*significant at p= 0.01 level; \*significant at p=0.05 level; and <sup>NS</sup>Significant at p=0.10 level; Parentheses indicates t-values; NS- Non-Significant

Table 3 shows the result of model (2) and exhibits the R&D and profitability relationship. It has been observed that the firms like Ford India Pvt. Ltd, General Motors India Pvt. Ltd, Hyundai Motor India Ltd, International Cars & Motors, Maruti Suzuki India Ltd, Ashok Leyland Ltd, Force Motors Ltd, S M L Isuzu Ltd, Tata Motors Ltd, V E Commercial Vehicles Ltd, Atul Auto Ltd, Bajaj Auto Ltd, Eicher Motors Ltd, Hero Motocorp Ltd, Mahindra Vehicle Mfrs. and T V S Motor Co. Ltd supported

the Schumpeter's (1961) hypothesis 'Profit is the reward for Innovation'. There were about 16 firms out of 25 that reveal significant relationship between R&D intensity with profitability. But, about 9 firms like Hindustan Motors Ltd, Honda Cars India Ltd, Mahindra Reva Electric, Asia Motor Works Ltd, Defence Land System, Kerala Automobiles Ltd, L M L Ltd, Scooters India Ltd and Yamaha Motor India Pvt. Ltd) have shown non-significant

relationship between R&D intensity and profitability.

## V. Discussion

The purpose of this study was twofold: First we examined the relationships between advertising and Firm's profitability. Advertising is an important market conduct variable for the firm which provides information about the product to the consumers and also persuades consumers to buy a particular product. Thus, it is an important element of non-price competition which affects the performance of a firm in the form of increasing their product sales. The findings of this study support a positive relationship between advertising and firm's profitability for most of the firms. This result is in line with the previous work of Nerlove and Waugh (1961: pp. 813-837), Telser (1962: pp. 471-499), Bloch (1974: pp. 267-286) and Sharma and Sharma (2009: pp. 83-96) who tested this relationship in different industries. Second, we analyzed the relationship between R&D and profitability of the firm. R&D is an important element of market conduct which positively affects the performance. R&D is generally measured in most of the studies, from the statistics of R&D expenditure, an absolute or a proportion of total annual budget of the firm. The present study also used ratio of R&D expenditure to sales as conduct variable to determine performance of Indian automobile industry. The result of this study reveals a positive relationship between R&D and profitability of the firm which is in accordance to the research of Yang *et.al* (2010: pp. 103-117), Bae and Kim (2003: pp. 51-76) and Pramod *et al.* (2012: pp. 1-21).

However, 8 and 9 firms in our sample showed non-significant association between

conduct variables (advertising intensity and R&D intensity) and performance variable (ratio of net profit to total sales turnover) respectively. It means advertising intensity and R&D intensity failed to boost profitability of firm. The cause of this deviation in results may be complex procedure of R&D investment and obtaining license for new designs for these firms, if approval is obtained it may be in the form of collaborations with foreign players. Besides, above factors poor credit facilities to consumers and automobile firms may be another important factor which affected the performance of the industry.

## VI. Policy Implications, limitations and future research

There are many time-series studies on advertising intensity, R&D intensity and profitability. Researchers like Farris and Buzzell (1979: pp. 112-122), Callahan, (1982: pp. 17-22) and Andras and Srinivasan (2003: pp. 81-90) investigated advertising intensity, R&D intensity and profitability relationship in different industries and they found that advertising intensity and R&D intensity are positively related to profit margins of firms.

This study may have some shortcomings. Firstly, we could include only 25 automobile firms because of the exclusion of the firms for which data related to advertising and R&D expenditure was not available and the search period was restricted to 1998-2014. Future research could include more firms in the sample to analyze these relationships and extend the search period. Secondly, study only deals with time-series data. There is possibility to analyze firm behavior using cross-sectional design in future research. Lastly, this study depicts a causal relationship between advertising intensity and profitability and also relationship between the firm R&D and profitability. Future research could reverse the

relationships by examining the effect of profitability on advertising and R&D expenditure by the firms. Fourth, this research is limited to automobile industry whereas future research can test the above mentioned relationships in firms of other industries viz. cement, pharmaceutical, iron and steel etc.

### References

1. Andras, T. L., & Srinivasan, S. S., 2003. Advertising intensity and R&D intensity: Differences Across Industries and their Impact on Firm's Performance, *International Journal of Business and Economics*, 2(2), pp. 81-90.
2. Archarungroj, P., & Hoshino, Y., 1999. Firm size and R&D on profitability: An empirical analysis on Japanese chemical and pharmaceutical industry, *Japanese Journal of Administrative Science*, 13(2), pp. 71-86.
3. Bae, S. C., & Kim, D., 2003. The effect of R&D investments on market value of firms: Evidence from the US, Germany, and Japan, *Multinational Business Review*, 11(3), pp.51-76.
4. Bloch, H., 1974. Advertising and profitability: a reappraisal, *Journal of political Economy*, 82(2, Part 1), pp. 267-286.
5. Callahan, F. X., 1982. Advertising and Profits 1969-78, *Journal of Advertising Research*, 22 (2), pp. 17-22.
6. Chauvin, K. W., & Hirschey, M., 1993. Advertising, R&D Expenditures and the Market Value of the Firm, *Financial Management*, pp. 128-140.
7. Farris, P. W., & Buzzell, R. D., 1979. Why advertising and promotional costs vary: Some cross-sectional analyses, *The Journal of Marketing*, pp. 112-122.
8. Geroski, P.A., Machin, S., & Reenen, V., 1993. Innovation and firm profitability, *Rand Journal of Economics*, 24, pp. 198-211.
9. Gupta, V. K., 1983. A Simultaneous Determination of Structure, Conduct and Performance in Canadian Manufacturing, *Oxford Economic Papers*, 35(2), pp. 281-301.
10. Hirschey, M., & Weygandt, J. J., 1985. Amortization Policy for Advertising and Research and Development Expenditures, *Journal of Accounting Research*, pp. 326-335.
11. Islam, M. F., Shahnaz, P., & Datta, K.R., 2014. Association between Advertising Expenditure and Sales Volume: A Case Study of Bajaj Auto Limited, *Bangladesh Research Publications Journal*, 9(3), pp. 162-167.
12. Kim, J., & Choi, Y., 2013. Linear Relationship between Reported Discretionary Expenditure and Sales Amount—Empirical Approach with IT Related Industry, *International Journal of Security and Its Applications*, 7(1), pp. 195-202.
13. Kumar, N., & Kaur, K., 2014. Some aspects of Indian automobile industry, *Social Vision*, 1(3), pp. 245-252.
14. Leonard, W. N., 1971. Research and Development in Industrial Growth, *Journal of Political Economy*, 79(2), pp. 232-256.
15. Leong, S. M., Ouliaris, S., & Franke, G. R., 1996. Estimating the long-term effects of advertising on sales: a co-integration perspective, *Journal of Marketing Communications*, 2(2), pp. 111-122.

16. Lucius, H. W., Habte-Giorgis, B., & Lee, J., 2008. Empirical study of the strategic impact of major marketing factors on firms accounting performance in the pharmaceutical industry. In *Estableciendo puentes en una economía global* (p. 13). Escuela Superior de Gestión Comercial y Marketing, ESIC.
17. Mahendru, M., & De, K. K., 2014. Multivariate Relation between Advertisements, Sales, and Profits: A Study on the Indian FMCG Industry, *Indian Journal of Marketing*, 44(6), pp. 7-23.
18. Nerlove, M., & Waugh, F. V., 1961. Advertising without supply control: Some implications of a study of the advertising of oranges, *Journal of Farm Economics*, 43(4), pp. 813-837.
19. Pramod, K. N., Krishnan, N., & Puja, P., 2012. R&D intensity and market valuation of firm: a study of R&D incurring manufacturing firms in India, MPRA Paper No. 37299, pp. 1-21.
20. Rajapathirana, R. J., & Hui, Y., 2018. Relationship between Innovation Capability, Innovation Type, and Firm Performance, *Journal of Innovation & Knowledge*, 3(1), pp. 44-55.
21. Sahu, S. K., Ramaswamy, S., & Choutagunta, A., 2017. Export Performance, Innovation, and Productivity in Indian Manufacturing Firms, *Working paper No. 2017/159*, pp.1-46.
22. Schumpeter, J. A., 1961. *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle (1912/1934)*, 4Th Ed. Munich, Leipzig: Von Duncker & Humbold. *Google Scholar*.
23. Sharma, S., & Sharma, J., 2009. Sales and advertisement relationship for selected companies operating in India: A panel data analysis, *School of Doctoral Studies (European Union) Journal*, 1(1), pp. 83-96.
24. Srinivasan, R., & Lilien, G. L., 2009. R&D, advertising and firm performance in recessions, *ISBM report*, 3, 2009, pp. 1-29.
25. Telser, L. G., 1962. Advertising and cigarettes, *Journal of Political Economy*, 70(5, Part 1), pp. 471-499.
26. Yang, K. P., Chiao, Y. C., & Kuo, C. C., 2010. The relationship between R&D investment and firm profitability under a three-stage sigmoid curve model: evidence from an emerging economy, *IEEE Transactions on Engineering Management*, 57(1), pp. 103-117.