Firm Size and Profitability in Indian Automobile Industry: An Analysis

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Abstract

Present study is an attempt to test the size and profitability relationship in the Indian automobile industry. The empirical evidence on size and profitability is vast and showed variations in results; few reported positive and few negative relationships between size and profitability. To analyze the relationship, the linear regression model has been employed over the years 1998 to 2014 as well as cross-sectionally. For profitability, ratio of net profit to total sales turnover and ratio of net profit to net assets plus working capital has been used whereas firm size is represented by total sales turnover and net assets. The study found mix results; time-series analysis showed the positive relationship and cross-section analysis showed that there exists no relationship between firm size and profitability.

Keywords: Automobile, Size, Profitability, Assets, Turnover

Introduction

The size of a firm is the important determinant of its profitability. Many researchers tried to examine the sources of variations in firm level profitability (e.g. Hall and Weiss, 1967; Singh and Whittington, 1968; Kamerschen, 1968; Amato and Wilder, 1985; Majumdar, 1997; John and Adebayo, 2013; Dogan, 2013). It is general opinion in the field of industrial economics that big firms have more competitive power as compared to small firms. The large size may bring economies or diseconomies. The size in economic terminology, defined as 'scale'- which may be scale of production, output or operation, constitutes, one of the important elements determining efficiency of a firm. Large firms may erect barriers to entry into the market which gives them a measure of monopoly power and degree of independence in their pricing and output decisions. Thus, it is an important cause of profitability. The size of firm may be affected by marketing, financial, technological and entrepreneurial factors. A firm well equipped with these factors, is successful in increasing its firm size. In the words of John and Adebayo (2013):

"Firm size has been recognized as an essential variable in explaining organizational profitability. The size of a firm is very essential in today's world due to the phenomenon of economies of scale. Bigger

firms can manufacture items on much lower costs in contrast to smaller firms. Firms of the modern era look to increase their size so as to get a competitive edge on their competitors by lowering production costs and increasing their market share" (p.1171).

Now, it is imperative to find out the different measures of firm size which are frequently used in the industrial study. Basically, there are three measures found on the basis of different literature: first, inputs into the productive process, secondly output; thirdly 'values' of firm. In the first category, the number of employees of a firm, the labour input, some measures of assets representing the capital input, quantity of raw material used or amount of power consumed can be included. In the second category, physical output is rarely used as a measure of firm size; instead a monetary value such as sales turnover is widely used. Third category includes the indicators of firm size as the stock holder's equity or value added by the firm (Kaur, 1997).

Size and Profitability: Evidence from Survey of Literature

In majority of the literature, size has been taken as a fundamental variable in explaining profitability where these studies attempted to identify the effect of firm size on profitability. The empirical evidence on size and profitability is vast and showed variations in results. Some studies reported positive and others negative relationship between size and profitability variables. The studies which showed positive relationships are Hall and Weiss (1967), Kamerschen (1968), Majumdar (1997), Jonsson (2007), Zubairi (2009), Lee (2009), Dogan (2013), Babalola and Abiodun (2013), and Sivathaasan et al. (2013).

Zubairi (2009) investigatd the size-profitabilty hypothesis in Pakistan automobile sector during 2000-2008. He found that firm size had direct effect on profitability of automobile firms in Pakistan. On the contrary Becker-Blease et al. (2010), Banchuenvijit (2012), Kouser et al. (2012) have found a negative relation between firm size and profitability. Other than above studies, Simon (1962), Whittington (1980) have found that firm size does not have any affect on profitability. They argued that firm profitability is independent from firm size. Niresh and Velnampy (2014) explored the effects of firm size on profitability of manufacturing firms in Sri Lanka during 2008-2012 and concluded that there is no indicative relationship between firm size and profitability in manufacturing firms.

The Indian Scenario

In international studies most of them support the positive relationship hypothesis between size and profitability variables. In India too, many researchers tested this relationship mostly for two and three digit manufacturing data and obtained mixed results like Nagarajan (1988), Kaur (1997) and Mistry (2012). Nagarajan (1988) tested the size-profitability relationship in pharmaceutical industry of India, using firm level data from 1970 to 1985. By using ratio of operating profits to total assets as profitability and total assets as measure of firm size the study observed some indication of a negative relationship between profitability and size. On the other hand Kaur (1997) obtained mixed results by utilizing 235 firms data of eight major industries groups over the period 1971 to 1991. She found that the degree of relationship is not uniform in all the eight industries. The coefficient of correlation varied from -0.002 to -0.48 and average profitability is largely independent of firm size. The inter-firm dispersion of profitability tends to decline with size, although the relationship was not very strong. With regard to incentives to greater industrial concentration, she concluded that profitability did not, on average, provide an incentive for large firms to grow at a relatively high rate. Majumdar (1997) tried to investigate size-profitability relationship in 1020 Indian firms. He found that big firms have a higher profitability compared to small firms. Mistry (2012) ascertained the determinant of profitability in Indian automobile industry and found that Debt-Equity Ratio, Inventory Turnover Ratio and Size (total assets) are the main determinants of profitability. He observed that regression coefficient of size had positive values during most of the years under the study, which suggests that there was a positive relationship between profitability and size. It means that the companies that are big in size have more profitability as compared to the companies which are small in size.

Variable Selection and Model Specification

On the basis of different studies national and international and availability of data as per the requirement of the study, below listed dependent and independent variables have been selected. Most of the studies used the same measures for profitability as well as firm size with little variation. The variables taken by different researchers have been presented below in tabular form.

Table 3.1: Dependent and Independent Variables available in literature

Author	Profitability	Size
Kamerschen (1968)	Rate of return on invested capital	Sales and total assets
Whittington (1980)	Rate of return on net assets	Net assets, gross assets, sales and value-added
Amato and Wilder (1985)	Rate of return on net assets	Net assets, sales and value - added
Nagarajan (1988)	Ratio of net income to total sales turnover	Total sales turnover, net assets
Kaur (1997)	Operating net profits to net sales, gross profits on total assets	Total assets, fixed assets, net sales
Mistry (2012)	Return on capital employed	Total assets
Dogan (2013)	Ratio of net profit after tax to total assets	Natural logarithm of total assets, natural logarithm of total sales
John and Adebayo (2013)	Return on assets (ROA)	Total assets, total sales turnover
Sivathaasan *et al.* (2013)	Return on equity (ROE)	Log of Total Assets

On the basis of review of above available literature, the variables selected for profitability and size for the present study are given below:

For Profitability: Two different measures have been used, (i) ratio of net profit to total sales turnover and (ii) ratio of net income to net assets plus working capital

For Firm Size: Two different indicators of firm size have been used, (i) total sales turnover and (ii) net assets

Hypotheses: The hypotheses usually used to test relationship among the variables employed in the study. The basic hypotheses on the basis of earlier literature designed are

H_1: Pr_1 is significantly determined by SIZ_1

H_1: Pr_1 is significantly determined by SIZ_2

H_1: Pr_2 is significantly determined by SIZ_1

The basic objective of this study is to check the effect of size on profitability by taking other factors remain constant like diversification, advertising, research and development and merger and acquisition, etc. For this we follow the format of Singh and Whittington (1968), Nagarajan (1988), Kaur (1997) and Dogan (2013). By following earlier studies linear regression model has been employed for the analysis.

$$Pr_1 = \alpha + SIZ_1\beta + U \ldots\ldots\ldots (1.1)$$

$$Pr_1 = \alpha + SIZ_2\beta + U \ldots\ldots\ldots (1.2)$$

$$Pr_2 = \alpha + SIZ_1\beta + U \ldots\ldots\ldots (1.3)$$

Where, Pr_1 is the ratio of net profit to total sales turnover

Pr_2 is the ratio of net profit to net assets plus working capital

SIZ_1 is a measure of firm size represented by total sales turnover

SIZ_2 is a measure of firm size represented by net assets

Results and Empirical Analysis

The results obtained are presented in table 4.1, 4.2 and 4.3. Then they are compared on the basis of the p-value and adjusted R^2; the model showing the lowest p-value and highest adjusted R^2 is taken as the best fit. Generally, p-value is used to test the significance of hypothesis that is made about a population.

Table 4.1: Regression Results (Time-Series) Model 1.1

Company Name	N	Intercept	SIZ_1	Adjusted R^2	p - value
Ford India Pvt. Ltd	8	0.138	0.198 (0.036) ^{NS}	0.166	0.972
Hindustan Motors Ltd	17	0.166	1.230 (2.098) *	0.175	0.053
Honda Cars India Ltd	17	0.185	-0.462 (-0.202) ^{NS}	0.063	0.842
Hyundai Motor India Ltd	17	0.348	-1.601 (-3.120) **	0.353	0.006
Maruti Suzuki India Ltd	17	0.111	0.444 (1.495)·	0.071	0.155
Ashok Leyland Ltd	17	-0.059	2.872 (3.359) **	0.421	0.004
Force Motors Ltd	17	0.212	-2.896 (-0.607) ^{NS}	0.041	0.552
S M L Isuzu Ltd	17	0.079	8.393 (5.081) ***	0.608	0.000
Tata Motors Ltd	17	-0.039	0.772 (3.180) **	0.362	0.006
Atul Auto Ltd	17	0.111	25.549 (2.124) *	0.180	0.050
Eicher Motors Ltd	16	0.219	-2.795 (-2.210) *	0.205	0.044
Hero Motocorp. Ltd	17	0.004	1.365 (2.307) *	0.212	0.035
L M L Ltd	6	0.035	4.088 (2.531)·	0.519	0.064
Scooters India Ltd	9	0.046	31.194 (2.134)·	0.307	0.070
Sooraj Automobiles Ltd	14	0.093	115.406 (1.561)·	0.099	0.140
T V S Motor Co. Ltd	17	0.057	1.338 (1.370)·	0.052	0.190
Yamaha Motor India Pvt. Ltd	9	-0.040	6.495 (3.614) **	0.601	0.008
General Motors India Pvt. Ltd	11	0.120	0.333 (0.084) ^{NS}	0.110	0.934
Kerala Automobiles Ltd	6	0.040	142.21 (7.824) ***	0.923	0.001
Kranti Automobiles Ltd	10	0.025	470.236 (1.196) ^{NS}	0.045	0.265
Bajaj Auto Ltd	8	0.041	1.644 (1.417) ^{NS}	0.126	0.206
Asia Motor Works Ltd	6	0.200	-20.618 (-4.447) **	0.789	0.011
V E Commercial Vehicles Ltd	6	0.056	2.983 (3.032) *	0.621	0.038
Mahindra Vehicle Mfrs.	5	0.098	2.663 (18.642) ***	0.998	0.000

Note: ***significant at p= 0.001level; **significant at p= 0.01 level; *significant at p=0.05 level; and ·Significant at p=0.10 level; Parenthesis indicates t-values; NS- Not Significant

The table 4.1 presents the result of model 1.1, where out of twenty four firms; seven firms are showing non-significant results. It means that these seven firms are not able to reject the null hypothesis i.e. profitability is not determined by firm size. Thus, these firms support the results of Simon (1962) and Whittington (1980). This results cause a vague understanding of the affect of firm size on profitability. Besides these results, five firms namely Hyundai Motor India Ltd, Force Motors Ltd, Eicher Motors Ltd, Honda Cars India Ltd and Asia Motor Works Ltd represented negative relationship between size and profitability and out of five, two firms are statistically significant. On the other hand, three firms (Mahindra Vehicle Mfrs, Kerala Automobiles Ltd and S M L Isuzu Ltd) registered highly significant result and support the earlier studies of Punnose (2008) and Lee (2009). In these three firms more than 90 per cent variations in profitability explained by size.

In table 4.2, where total assets have been taken as size variable and ratio of net profit to sales turnover as profitability variable, ten firms showed insignificant relationship between size and profitability variables.

Table 4.2: Regression Results (Time-Series) Model 1.2

Company Name	N	Intercept	SIZ_2	Adjusted R^2	p - value
Ford India Pvt. Ltd	8	0.201	-0.948 (-2.262)'	0.370	0.064
Hindustan Motors Ltd	17	0.168	1.401 (1.560)'	0.0823	0.139
Honda Cars India Ltd	17	0.275	-3.140 (-4.590) ***	0.556	0.000
Hyundai Motor India Ltd	17	0.243	-0.612 (-1.058) NS	0.007	0.306
Maruti Suzuki India Ltd	17	0.276	-0.418 (-1.894)'	0.139	0.077
Ashok Leyland Ltd	17	0.225	-0.968 (-.3.551) **	0.456	0.002
Force Motors Ltd	17	0.192	-1.906 (-0.352) NS	0.057	0.729
S M L Isuzu Ltd	17	0.164	-14.013 (-5.506) ***	0.646	0.000
Tata Motors Ltd	17	0.243	-0.325 (-2.586) *	0.262	0.020
Atul Auto Ltd	17	0.144	0.138 (0.008) NS	0.066	0.993
Eicher Motors Ltd	16	0.190	-1.065 (-0.765) NS	0.028	0.456
Hero Motocorp Ltd	17	0.121	0.721 (1.357)'	0.050	0.194
L M L Ltd	6	0.449	-16.421 (-1.915)'	0.347	0.127
Scooters India Ltd	9	0.189	-55.019 (-1.359) NS	0.095	0.216
Sooraj Automobiles Ltd	14	0.130	-147.785 (-0.808) NS	0.027	0.434
T V S Motor Co. Ltd	17	0.071	1.346 (2.047) *	0.166	0.058
Yamaha Motor India Pvt. Ltd	9	0.258	-6.584 (-1.662)'	0.180	0.140
General Motors India Pvt. Ltd	11	0.174	-1.607 (-1.084) NS	0.017	0.306
Kerala Automobiles Ltd	6	0.099	332.620 (1.153) NS	0.0621	0.312
Kranti Automobiles Ltd	10	0.167	-914.867 (-2.575) *	0.384	0.032
Bajaj Auto Ltd	8	0.284	-2.037 (-1.814)'	0.246	0.119
Asia Motor Works Ltd	6	0.192	-4.134 (-6.844) **	0.901	0.002
V E Commercial Vehicles Ltd	6	0.104	1.102 (0.754) NS	0.094	0.492
Mahindra Vehicle Mfrs.	5	-0.236	10.302 (0.810) NS	0.093	0.476

Note: ***significant at p= 0.001level; **significant at p= 0.01 level; *significant at p=0.05 level; and 'Significant at p=0.10 level; Parenthesis indicates t-values; NS- Not Significant

The remaining firms also did not indicate highly significant relationship, about seven firms showed significant relationship at 0.10 per cent level. Honda Cars India Ltd and S M L Isuzu Ltd indicated negative but highly significant relationship between size and profitability, where p-value is highly significant at 0.001 per cent level. Most of the firms show negative relationship between size-profitability, which further supports the study of Nagarajan (1988), who employed the total assets and ratio of income to sales turnover in Indian pharmaceutical industry over the period of 1970 to 1983 as measures of size and profitability respectively.

Table 4.3: Regression Results (Time-Series) Model 1.3

Company Name	N	Intercept	SIZ_1	Adjusted R^2	p - value
Ford India Pvt. Ltd	8	0.623	-14.702 (-0.604) ^{NS}	0.099	0.567
Hindustan Motors Ltd	17	0.913	-1.266 (-0.304) ^{NS}	0.0661	0.764
Honda Cars India Ltd	17	-0.281	38.506 (1.635)$^{\cdot}$	0.094	0.122
Hyundai Motor India Ltd	17	0.456	1.381 (0.731) ^{NS}	0.029	0.475
Maruti Suzuki India Ltd	17	1.459	-1.706 (-0.574) ^{NS}	0.043	0.574
Ashok Leyland Ltd	17	-0.738	17.336 (2.775) **	0.339	0.014
Force Motors Ltd	17	0.215	44.222 (1.632)$^{\cdot}$	0.094	0.123
S M L Isuzu Ltd	17	-3.344	820.657 (8.830) ***	0.827	0.000
Tata Motors Ltd	17	-1.101	6.404 (3.537) **	0.418	0.002
Atul Auto Ltd	17	-0.155	745.716 (6.893) ***	0.744	0.000
Eicher Motors Ltd	16	1.484	-25.290 (-2.290) *	0.220	0.038
Hero Motocorp Ltd	17	-0.698	18.826 (2.379) *	0.225	0.031
L M L Ltd	6	-0.229	30.854 (7.715) ***	0.921	0.000
Scooters India Ltd	9	-1.009	859.822 (8.357) ***	0.895	0.000
Sooraj Automobiles Ltd	14	0.174	1418.804 (3.618) **	0.481	0.003
T V S Motor Co. Ltd	17	0.347	6.151 (1.041) ^{NS}	0.005	0.314
Yamaha Motor India Pvt. Ltd	9	-0.056	13.258 (3.111) **	0.520	0.017
General Motors India Pvt. Ltd	11	0.021	13.897 (1.000) ^{NS}	0.008	0.343
Kerala Automobiles Ltd	6	0.896	2356.744 (4.173) **	0.766	0.013
Kranti Automobiles Ltd	10	-2.391	20102.83 (3.444) **	0.547	0.008
Bajaj Auto Ltd	8	-2.439	46.432 (2.175)$^{\cdot}$	0.347	0.072
Asia Motor Works Ltd	6	0.115	-8.590 (-0.934) ^{NS}	0.026	0.403
V E Commercial Vehicles Ltd	6	0.298	21.908 (0.774) ^{NS}	0.087	0.481
Mahindra Vehicle Mfrs.	5	-0.123	25.126 (10.511) ***	0.964	0.000

Note: ***significant at p= 0.001level; **significant at p= 0.01 level; *significant at p=0.05 level; and $^{\cdot}$Significant at p=0.10 level; Parenthesis indicates t-values; NS- Not Significant

The table 4.3 tests the hypothesis whether firm size (total sales turnover) affected the profitability indicator (ratio of net income to net assets plus working capital). Most of the firms show significant relationship except eight firms (Ford India Pvt. Ltd, Hindustan Motors Ltd, Hyundai Motor India Ltd, Maruti Suzuki India Ltd, T V S Motor Co. Ltd, General Motors India Pvt. Ltd, Asia Motor Works Ltd and V E Commercial Vehicles Ltd) out of twenty four firms and five firms (S M L Isuzu Ltd, Atul Auto Ltd, L M L Ltd, Scooters India Ltd, and Mahindra Vehicle Mfrs) exhibit highly significant Size-Profitability relationship.

We also further investigated the size-profitability relationship at cross-sectional level over the years 1998 to 2014, using above said regression model. The results of these are given below in table 4.4, 4.5 and 4.6.

Table 4.4: Regression Results (Cross-Section) Model 1.1

Year	N	Intercept	SIZ_1	Adjusted R^2	p - value
1998	17	0.138	0.340 (2.163) *	0.187	0.047
1999	18	0.802	5.416 (-0.638) ^{NS}	0.036	0.532
2000	19	0.148	0.086 (0.361) ^{NS}	0.050	0.721
2001	19	0.149	0.214 (1.089) ^{NS}	0.010	0.291
2002	21	0.163	0.158 (0.907) ^{NS}	0.008	0.375
2003	22	0.138	0.416 (2.803) **	0.276	0.012
2004	19	0.163	0.293 (2.804) **	0.276	0.012
2005	20	0.143	0.422 (2.805) **	0.265	0.011
2006	21	0.132	0.399 (2.269) *	0.171	0.035
2007	19	0.142	0.350 (2.035) *	0.148	0.057
2008	18	0.113	0.117 (0.622) ^{NS}	0.037	0.542
2009	19	0.118	0.127 (0.828) ^{NS}	0.017	0.419
2010	19	0.127	0.097 (0.596) ^{NS}	0.037	0.558
2011	17	0.149	-0.101 (-0.297) ^{NS}	0.060	0.769
2012	15	0.208	-0.440 (-1.020) ^{NS}	0.002	0.326
2013	16	0.144	-0.041 (-0.215) ^{NS}	0.067	0.836
2014	14	0.140	-0.018 (-0.112) ^{NS}	0.082	0.912

Note: ***significant at p= 0.001level; **significant at p= 0.01 level; *significant at p=0.05 level; and 'Significant at p=0.10 level; Parenthesis indicates t-values; NS- Not Significant

Table 4.5: Regression Results (Cross-Section) Model 1.2

Year	N	Intercept	SIZ_1	Adjusted R^2	p - value
1998	17	0.152	0.105 (0.597) ^{NS}	0.041	0.559
1999	18	0.790	-3.376 (-0.625) ^{NS}	0.037	0.540
2000	19	0.158	-0.101 (-0.448) ^{NS}	0.046	0.659
2001	19	0.151	0.192 (1.044) ^{NS}	0.005	0.310
2002	21	0.162	0.169 (1.041) ^{NS}	0.004	0.310
2003	22	0.142	0.330 (1.927)$^{\cdot}$	0.114	0.068
2004	19	0.165	2.512 (2.150) *	0.167	0.046
2005	20	0.146	0.354 (1.967)$^{\cdot}$	0.131	0.064
2006	21	0.130	0.432 (2.191) *	0.159	0.041
2007	19	0.145	0.280 (1.556)$^{\cdot}$	0.073	0.137
2008	18	0.118	0.026 (0.139) ^{NS}	0.061	0.890
2009	19	0.123	0.024 (0.167) ^{NS}	0.057	0.868
2010	19	0.133	-0.017 (-0.107) ^{NS}	0.058	0.915
2011	17	0.154	-0.179 (-0.592) ^{NS}	0.042	0.562
2012	15	0.202	-0.356 (-1.054) ^{NS}	0.007	0.310
2013	16	0.152	-0.166 (-1.098) ^{NS}	0.013	0.290
2014	14	0.150	-0.149 (-1.187) ^{NS}	0.030	0.257

Note: ***significant at p= 0.001level; **significant at p= 0.01 level; *significant at p=0.05 level; and $^{\cdot}$Significant at p=0.10 level: Parenthesis indicates t-values; NS- Not Significant

Table 4.6: Regression Results (Cross-Section) Model 1.3

Year	N	Intercept	SIZ_2	Adjusted R^2	p - value
1998	17	0.881	-2.709 (-1.300) ^{NS}	0.041	0.213
1999	18	0.885	-2.408 (-1.110) ^{NS}	0.013	0.283
2000	19	0.837	-3.178 (-1.533) ^{NS}	0.069	0.143
2001	19	1.241	-3.926 (-1.455) ^{NS}	0.058	0.163
2002	21	1.284	-3.793 (-1.313) ^{NS}	0.034	0.204
2003	22	1.369	-3.669 (-0.900) ^{NS}	0.009	0.378
2004	19	1.764	-4.021 (-0.971) ^{NS}	0.003	0.344
2005	20	1.124	0.202 (0.056) ^{NS}	0.055	0.955
2006	21	0.949	0.061 (0.025) ^{NS}	0.052	0.980
2007	19	0.791	-0.152 (-0.106) ^{NS}	0.058	0.916
2008	18	0.575	-0.908 (-0.675) ^{NS}	0.033	0.509
2009	19	0.622	-0.560 (-0.450) ^{NS}	0.046	0.657
2010	19	0.812	-1.179 (-0.659) ^{NS}	0.032	0.518
2011	17	0.944	-1.888 (-0.968) ^{NS}	0.003	0.348
2012	15	1.758	-5.459 (-1.096) ^{NS}	0.014	0.292
2013	16	1.076	-3.161 (-1.904)$^{\cdot}$	0.149	0.077
2014	14	1.100	-3.092 (-1.896)$^{\cdot}$	0.166	0.082

Note: ***significant at p= 0.001level; **significant at p= 0.01 level; *significant at p=0.05 level; and $^{\cdot}$Significant at p=0.10 level: Parenthesis indicates t-values; NS- Not Significant

It is observed that when size-profitability hypothesis is tested cross-sectionally, the results from 2003 to 2007 turned out to be statistically non-significant in model 1.1(table 4.4) and model 1.2 (table 4.5) and in model 1.3 (table 4.6). So the results indicate no relationship between size- profitability, which support Nagarajan (1988), Simon (1962) and Whittington (1980) studies. Thus cross-sectional regression exhibits low relationship between size-profitability variables.

Conclusion

The Indian automobile industry occupies a prominent place in Indian economy. It passed from different phases, the emergence of indigenous automobile manufactures and self reliance before 1983 to Freedom to Grow after 1991 economic reforms. For considering Structure-Conduct-Performance Paradigm, this study obtained mix results, time-series analysis showed the positive relationship between firm size and their profitability. On the other hand when analyzed cross-sectionally, the results indicate no relationship between firm size (SIZ_1 is a measure of firm size presented by total sales turnover and SIZ_2 is a measure of firm size presented by net assets) and profitability indicators (Pr_1 ratio of net income to total sales turnover and Pr_2 is the ratio of net income to net assets plus working capital), which means profitability of any firm is independent of firm size.

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