AN ANALYSIS OF INVESTMENT BEHAVIOUR IN INDIAN AUTOMOBILE MANUFACTURING INDUSTRY

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1. Introduction

In order to improve the performance and give a boost to this industry various steps have been taken by the government especially after 1975. To introduce price competitiveness in the industry price control on vehicles was removed in 1975. Again to improve the quality of products the government has allowed the import of technology, spare parts and components, and raw material since 1982. Also direct foreign investment has been allowed in the form of equity participation by the multinationals to take advantage of their experience.

Consequently modern technology has been inducted and demand for products has improved. The demand for vehicles in India has gone up considerably (from 78,000 in 1966-67 to 2,30,000 in 1985-86) although it is not still sufficient to benefit from economies of scale in production. The prices of Indian vehicles are quite comparable (rather lower for some of the commercial vehicles) than their counterparts in Europe or U.S.A. but on account of inferior qualiy of products and want of after-sale service net work the share of exports of Indian vehicles in the international market is around 0.1 per cent.[1]

Presently the industry is caught in a vicious trap of low level efficiency, poor demand for products, high domestic prices, less of profits and investments and so on. What is required is huge investments that may pull the industry out of this trap.

In the light of these developments we proceed to analyse the investment behaviour of the industry over two decades i.e., 1966-67 to 1986-87.

Valuation ratio (Tobin q) has been used as an alternative measure of profitability instead of the traditional accounting approach to measure profits. Also q has been used as a principal determinant of investment along with other financial and non-financial explainatory variables.

II. Objectives of the Study

The purpose of the present study is to analyse the impact of major industry policy changes related to the industry using Tobin q. As explained above two major developments have taken place since the mid 1970s. *First,* relates to the removal of price controls on cars and medium and heavy commercial vehicles from 1975[2] and allowing manufacturers to revise the prices of their vehicles on the basis of increase in the prices of raw materials and components and changes in the various taxes and duties. The second development relates to the government's decision in 1981 of taking over Maruti Udyog limited into its fold and then allowing liberal imports of technology, raw materials and components, foreign direct investment in the form of equity participation, etc. The industry policy was further liberalised in 1985 allowing diversification through broad-banding and introducing MODVAT scheme of taxation in 1986. Hence, the study aims at analysing the investment behaviour with a view to gain insight into the effect of policy changes on the investment behaviour of the industry in question.

Scope of the Study

The present study is confined to the manufacturers of cars, jeeps, trucks, buses and a variety of light commercial vehicles in the private sector only.[3] Each of the manufacturers in this sector produces many other products also along with spare parts and components for original use and replacement purpose but the share of main product in the total vale of production for each producer is more than 80% except for Mahindra and Mahindra who produce tractors also on a large scale and Bajaj Tempo limited who also produce three wheelers. Hence, only seven firms for which time series data are available for the period 1966-67 to 1986-87 constitute the industry. These firms are (1) Hindustan Motors Limited (HML), Premier Automobiles Limited (PAL), Standard Motor Products of India Limited (SMPL), Mahindra and Mahindra Limited (MML), Ashok Leylands Limited (ALL), Bajaj Tempo Limited (BTL), and Tata Engineering and Locomotives Limited (TELCO).

The study is based on the data for the period 1966-67 to 1986-87 obtained from the official directory of Bombay Stock Exchange and supported by Annual reports of the companies which contain the balance sheets and profits and loss accounts for the year. The starting year has been chosen as 1966-67 since Bajaj Tempo Limited started the manufacture of fourwheelers in this year only (before this the company was producing three wheelers). Also price control on light commerical vehicles was removed in 1966-67 and this sector was declared and placed in the priority list of the government. On the other hand, price controls on cars was made formal and more rigid. The closing year 1986-87 has been chosen on account of the limitaion of availability of data at the time of data analysis. Other sources of data include Reserve Bank of India Bulletins, Blue books published by the Association of Automobile Ancillary and Vehicle Manufacturers, Bombay.

The study is splitted into two sectors namely the car sector and non-car sector, Car sector includes HML, PAL and SMPL while non-car sector has MML, ALL, BTL and TELCO. Although commercial vehicles are produced by all the seven firms but the contribution of car sector in the production of commerical vehicles is small (less than 10 per cent).

Section III explains the concept of Tobin q and also describes briefly the Tobin's q theory of investment.

The model is given in secton IV. This describes the determinants of investment and then gives mathematical formulation of the model. Results are explained in the next section V.

III. Tobin 'q' Theory of Investment

Conventionally, profitability is measured as the ratio of profits before tax (after paying interest) to the book value of capital (fixed assets plus working capital) or alternatively as the ratio of net profits (after tax payments) to net worth. However, this ratio does not depict the true picture of profitability on account of the faulty accounting practices particularly in an inflationary situation for the following reasons :

— The numerator is a flow variable for one particular year while the denominaor is a stock variable and represents the sum of capital values at different points of time.

— Investment allowance, subsidies and other incentives affect the taxation of profits and hence the rate of return on capital.
— The depreciation on physical assets is not an economic depreciation and thus the net profit does not reflect the real return on capital.
— Risk factor is not reflected in profits.
— Intangible assets such as goodwill, efficient management and future growth prospects of the firm affects its share price and not necessarily the profits.

Hence, as a consequence of faulty accounting practices the cost of capital and profitability would be affected by inflation which in turn will effect the security prices of the company. Tobin 'q' was used for the first time by Lindenberg and Ross (1981) as a measure of monopoly rents. Tobin identifies 'q' as a link variable between the financial markets and market for real goods and services. The essence of their argument is that for firms in perfectly competitive industries with free entry the present value of future cash flows should reflect the mere replacement cost of duplicating the assets of the firm.

Following Tobin and *Brainard* (1977) 'q' is simply the ratio of market valuation of reproducible capital assets to the current replacement cost of assets.[4] If the market valuation of an asset is higher than the cost of purchasing it than there will be an incentive to invest in that asset. Therefore, the authors argue that investment is related to 'q'. In spite of the micro economic origin of q it has been employed largely to explain the investment behaviour of aggregate of non-financial corporations.

Although marginal q is more relevant to explain the investment behaviour, however, empirical implementaion of Tobin q has been done in terms of average q. This has been done to rely on an observable market variable to summarise all the information regarding technology and market conditions, etc.

Hayashi (1982) has given a rigorous analysis of the relationship between average q and marginal q[5]. He concludes that marginal q is identical to average q under perfect competition and constant returns to scale.

As explained above, Tobin (1969), Tobin and Brainard (1977) and others have argued that 'q' determines investment. According to Abel (1979), Neoclassical investment theory modified by the assumption of adjustment Costs (that is Putty Clay theory) and Tobin's q theory are equivalent. Similar results have been obtained by Hiroshi Yoshkawa (1981). The authors derive 'q' theory of investment following Lucas Uzawa investment model (1967) which emphasize the role of adjustment costs. They conclude that the optimality condition requires the equality of 'q' to the marginal effective cost of investment which in turn depends upon the adjustment cost function. Housman (1973) concludes that putty-clay model is superior to both the accelrator and Jorgenson's new classical model in terms of goodness of fit and predictive power. The major objectionable assumption of neoclassical approach is that capital equipment can be costlessly reshaped in accordance with changes in relative prices. Hence, the later work of Jorgenson has incorporated an assumption of convex costs of adjustment into his neoclassical model of investment. Also expectations are crucial in the new approach. Therefore, adjustment costs introduce a wedge between the demand and supply price of an asset.

IV. Model

As stated earlier the objective of the study is to investigate the applicability of Tobin's q to explain the investment behaviour of the industry in question and also to analyse the impact of major policy changes on invesment decisions.

q has been described as an important determinant of investment expenditures. Also a rapidly growing demand for the product may stimulate investment through increased installed and better utilised capacities

Again, tax incentives and the availability of finance provide stimulus and funds for investment;

Other important explanatory variables may be lagged investment expenditures, capital output ratio, age, the existing stock of fixed capital and inventory investment. The first two variables are expected to have positive coefficients while the others may have negative coefficients. Hence, the investment equation is written as

$$\frac{IF}{K} = a\ \beta 1\ g + \beta 2\ q + \beta 3\ Scu + \beta 4\ Taxplan + \beta 5\ GRP/S$$
$$+ \beta 6\ Loans/S + \beta 7\ (IF/K)-1 + \beta 8\ COR + \beta 9\ Age$$
$$+ \beta 10\ INV/S + u$$

V. Empirical Results

OLS method of estimation was applied to estimate the investment equation separately for the Car and non-Car sector. There are three firms in the Car sector VIZ., HML, PAL and SMPL while there are four firms in the non-car sector namely MML, ALL, BTL and TELCO. Since we have time series data for the period 1966-67 to 1986-87, therefore, the data is pooled to obtain time series of cross section data for each sector. In order to take care of hetroscedasticity problem variables are considered in the form of ratios such as IF/K for the dependent variables and research intensity, export intensity, q, vertical integration leverage, etc. as independent variables. Again, in the Car sector since three firms data are pooled together, therefore, we have used two dummy variables D1 and D2

D1 = 1 for the second firm data
    = 0 otherwise
D2 = 1 for the third firm data
    = o otherwise

Similarly for the non-Car sector since there are four firms whose data are pooled together three dummy variables D1, D2, D3 are used. OLS results for the two sectors are given below :

Results for CAR Sector

$$\frac{IF}{K} = -0.030 + \underset{(2.52)}{0.296\ q} - \underset{(2.00)}{0.279\ PCDUM} + \underset{(4.05)}{0.523\ ILDUM} - \underset{(1.19)}{0.124\ D1} + \underset{(0.63)}{0.066\ D2}$$

$$\bar{R}^2 = 0.571$$

Results for Non-Car Sector

$$\frac{IF}{K} = -0.093 + \underset{(2.74)}{0.429}\ q + \underset{(1.80)}{0.221}\ \text{Taxplan} + \underset{(1.82)}{0.228}\ \text{Loans/S}$$

$$+ \underset{(1.00)}{0.110}\ \text{ILDUM} + \underset{(0.90)}{0.09}\ \delta cu + \underset{(0.09)}{0.014}\ \text{Div} + \underset{(0.994)}{0.138}\ IF_{-2}$$

$$- \underset{(0.092)}{0.151}\ D1 - \underset{(0.13)}{0.022}\ D2 + \underset{(0.33)}{0.049}\ D3$$

$$\bar{R}^2 = 0.32$$

Our study reveals that Tobin q has remained less than unity throughout the period of the study while invesments have grown at the rate of about 7 per cent (at constant prices). These results do not support q theory of investment but these results are consistent with the earlier findings of Reserve Bank of India's study for the Indian corporate sector over the period 1960-61 to 1977-78 and also consistent with a study on U.S. railroads 1980-84 by the department of Jusitice U.S.A. It has been argued by Aurbach (1978) and others that $q < 1$ may also encourage investment due to several financial and non-financial factors such as tax incentives, leverage, credit facilities, etc. In the developing countries like India, rapid technological changes in the imported capital and absolescence of output from old capital, might make the new capital more attractive than the old capital and hence boost investment (Although $q < 1$).

The investment equation shows that q has a positive coefficient which is also statistically significant. Other important variables to explain investment behaviour of the Car sector are found as the availability of finance (internal and external), capacity utilisation and industry policies. Price control policy is found to have adversely affected investments while import liberalisation policy seems to have encouraged investments in the Car sector only.

Investments in the non-car sector are also found to have been encouraged by tax incentives, age of the firm, capacity utilisation and size of the firm.

On the whole our results seem to be better than the earlier studies on q theory as we have introduced several financial and non-financial variables alongwith q (mentioned above) which are also found to be statistically significant.

Appendix—1
Variables Used And Their Definitions

q	Tobin q (See Appendix 1)
PRR	Profit Rate = Ratio of profits after tax but inclusive of interests to the net worth plus borrowings (short and long term)
PC Dum	Price Contorl Dummy Variable (Defined in the text)
IL Dum	Liberalisation Policy Dummy Variable (Defined in the text)
Size (S)	Net Sales during a year
Adv.	Advertisement intensity = Advertisement expenditure to net sales ratio
CU	Capaciy utilisation index = $\frac{\text{Actual production}}{\text{Installed capacity}} \times 100$
δ	First order difference = $K_t - k_{t-2}$ for any k
VI	Vertical integration index = Value added to net sales ratio

GRP	Gross retained profits = Gross profits after interest and taxes and taxes minus dividend paid and provision for development rebate reserves
q	Growth of sales = $(S_t - S_{t-1})/S_{t-2}$
INV	Inventories investment = This is defined as the flow of inventories during a year.
Loans	Flow of Total borrowings (short term and long erm) including debentures issued
MT	Import of technology = proxied by the payment of technical fees and royalties
FEO	Foreign equity share
IF	Fixed investment = This is defined as the flow of gross fixed assets (K_e) in a year = $K_e - k_{t-2}$ where K_e is measured as explained in Appendix 1
Div	Diversification index = $(1 - \sum_i S_t^2)$ where S1 denotes the share of ith product for the multi-product firm
Age	Age of plant & Machinery proxied by the ratio of net to gross fixed assets
Taxplan	Tax incentives to capital stock ratio
COR	Fixed Capital-output (value added) ratio
X	Exports intensity defined as the ratio of total exports by the firm to its net sales.

Appendix — 2

Meaurement of 'q'

We have followed Lindenberg and Ross (1981) and Smirlock et.al. (1984) methods to estimate q.

$$\text{Tobin } q = \frac{\text{Market value of the firm}}{\text{Replacement cost of the assets}}$$

Value of the firm consists of the value of the shareholder's money and the total liabilities of the firm

Liabilities are repaid on the basis of the book values while the shareholder's wealth depend upon the market share price. Thus, shareholders money value has been obtained as the sum of preference Share Capital (face value) and the market value of equity capital (inclusive of share holder's reserves).

Replacement cost of assets is the sum of values of inventories and fixed assets at *current prices* plus the value of miscellaneous current assets (total current assets – inventories). Replacement value is calculated as the product of book value and the current price index of the assets with reference to some base year. Measurement of marginal as well as average q are troublesome on account of the estimation of replacement cost of fixed capital. Technological obsolescence is rarely dealt with explicitly. Replacement cost of R & D capitalised in the form of technical know how and patents, etc. are not considered. R & D as well as advertisement expenditures produce benefits over periods beyond the one in which these expenditures really occur thus the estimates of replacement cost are under estimated. The developing countries generaly import the technology and machinery, etc to start with and later on spend on R & D to adopt it. Such machines are used for decades with slight modifications in the developing countries. The estimation of replacement cost of such assets is controversial. Market valuation of a firm is also debatable on account of various sources of funds.

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Footnotes :

1. World Bank Report on Indian Automobile Industry (1987).
2. Price controls on Light Commerical Vehicles have already been removed since 1967.
3. The sudy excludes one manufacturing unit in the public sector (for which data is available from 1983-86 only) viz. Maruti Udyog Limited.
4. For measurement of q ratio see Appendix 1.
5. Hayashi Fumio (1982) Econometrica Vol. 50, No. 1 1982.