The Developing Economies, XXXII-2 (June 1994)

GROWTH AND PROFIT BEHAVIOR OF LARGE-SCALE INDIAN FIRMS

N. S. SIDDHARTHAN
B. L. PANDIT
R. N. AGARWAL

I. INTRODUCTION

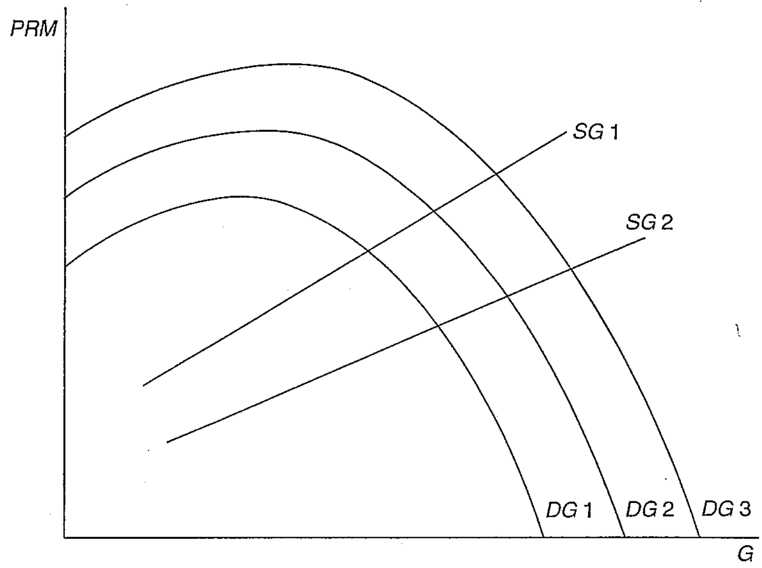
THIS paper analyzes inter-firm variations in the performance of the large public limited companies (that is, companies whose equities are quoted on the stock exchange) belonging to the private corporate sector in India during the period 1981–84. The paper uses the Marris managerial framework to analyze growth, profits, investment rates, inventory investment rates, external financing, and divided rates.

With regard to the sample used, the intention was to consider the top 500 firms; however, we decided to consider only the manufacturing firms, thus leaving out the trading and other nonmanufacturing firms, as well as firms that were not in active manufacturing during the late 1970s. Since the model considers lagged variables we decided to include only those firms that were in continuous business since the late 1970s. The final sample therefore consists of 385 firms. In analyzing the inter-firm variations, the model considers two performance indicators, namely, growth and profits. Growth, *G*, is measured by growth of sales revenue. Two concepts of profits are used alternately in two versions of the model: (1) profit margin, *PRM* (gross profits as a percentage of sales) and (2) profits rate, *PRR* (gross profits plus interest payments as a percentage of shareholders' capital plus borrowing, the financial counterpart of gross assets).

Section II discusses the model and presents the structure of the equations that are to be estimated, then examines the simultaneities involved in the system. Section III analyzes the main determinants of profits and growth, while Section IV is devoted to an analysis of fixed and inventory investment. The financial decisions of the firms are examined in Section V, and the last section (Section VI) is devoted to an analysis of impact multipliers based on the derived reduced-form equations and highlighting the main conclusions and policy implications of the paper.

N. S. Siddharthan and R. N. Agarwal are from the faculty of the Institute of Economic Growth, and B. L. Pandit is from the faculty of the Delhi School of Economics. We are grateful to Professors A. L. Nagar, K. L. Krishna, S. K. Goyal, and Mr. Challapathi Rao for their suggestions and comments. Our thanks also go to Miss Seema Gupta for her statistical assistance. We likewise greatly appreciate the detailed comments made by a referee of this journal.

Fig. 1. Growth of Demand and Supply



II. ANALYTICAL FRAMEWORK AND THE MODEL

In analyzing the inter-firm variations in performance, the paper will broadly follow the managerial model developed by Marris [23]. In the Marris model there is no optimum firm size; instead, there is an optimum growth path. The model deals with the demand for and supply of growth functions rather than static demand and supply functions. Firms consciously try to equate the demand and supply curves of growth in order to avoid excess capacity and shortages. However, there could be short-term fluctuations and gaps between demand and supply. Growth is mainly achieved through diversification. The Marris model has three equations: (1) a demand for growth (*DG*) equation, where *DG* is considered as a function of successful diversification; (2) a supply of growth (*SG*) equation, where *SG* is determined by retention ratio; and (3) a diversification equation where diversification is determined by capital-output ratio and profit margins. It was postulated that at low levels of growth both profits and growth rates could increase; but at higher levels of growth, profit motive would have to be sacrificed at the margin, in favor of growth motive. However, this assumes that the *DG* curves do not shift, or that diversification does not influence the super environment in which the firm operates.

In the literature, Figure 1 is normally used to illustrate the model. The actual growth and profit position of the firm is indicated by the intersection point of the *DG* and *SG* curves. However, it is possible for the firms to shift the *DG* and *SG* curves; that is, change the environment in which the firms operate, so that some firms could enjoy higher values for both *PRM* and G. Initially, Marris [23] considered *SG* curves to be fixed and allowed only *DG* curves to shift, as he felt that the environment determining retention ratio and the threat of takeover in the share market might not differ across firms, since stock markets were more competitive than goods markets. However, in India, as a result of government intervention and the dominant role of financial institutions belonging to the public sector, the growth of supply curve could also differ among the firms. The data also reveals wide differences in the financial ratios of the firms. Hence in this paper we will also allow for the shifting of *SG* curves.

Marris developed a theoretical model which is not directly amenable to empirical estimation. It is not possible to estimate the *DG* and *SG* curves as the actual observations of profits and growth, for the sample firms will be on the intersection points and not on the other portions of the two curves. However, it is possible to use the Marris framework to develop testable hypotheses and build an econometric model. Our paper follows this alternative. The paper deals with a cross section sample of firms and aims at explaining inter-firm differences in profits and growth. In other words it seeks to answer the question; namely, why do some firms grow faster and enjoy higher profits than others. It uses the Marris framework to analyze the problem. In Figure 1 the actual values of profits and growth for the sample firms will be at the intersection points of *DG* and *SG* curves. Using that figure we argue that some firms enjoy higher growth and profits as they happen to be on a preferred curve. Thus, given the *SG* curve, a firm on *DG*3 will have higher growth and profits compared to *DG*1. The shift from *DG*1 to 2 and 3 is explained in terms of variables that can be measured. Marris identified some of these factors, like the industry where the firm in question operated, (this factor was emphasized, since there are substantial inter-industry differences in technological opportunities and growth prospects), and factors contributing to product diversification like innovative activity, product creation, and advertising. As seen from the figure, both differential growth and profits are determined by the shifts in the curves. Marris emphasized growth through diversification. We have not directly measured diversification, but have identified and introduced variables contributing to product as well as international diversification. These variables will enable the firms to diversify and shift to a preferred *DG* curve. This procedure is in conformity with Marris, since he emphasized variables representing diversification rather than the actual state and measurement of diversification.

Hay and Morris [17, Chap. 10] suggest that the following variables could shift the *DG* curves: the industry where the firms operate, the size of the firm, the level of innovative activity, and marketing skill. Marris emphasized all these variables as demand shift variables. Siddharthan and Lall [32] found R&D and advertising intensity important in explaining the growth of large U.S. multinational companies (MNCs). They also introduced multinationality as a separate variable that could overcome the domestic demand constraint and increase growth and profits by shifting the *DG* curve. Our work also allows for shifts in the *SG* (supply of growth) curve. Shifts in the supply of growth can materialize through investment activity, whether in fixed assets or inventories. The model will also take into account the financial constraints on investment behavior.

The model consists of seven equations including an identity explaining profits *PRM* and *PRR*, growth *G*, fixed investments *IF*, inventory investment *INV*, external finance *ESF*, and dividend rate *DVD*. The estimation of *DG* curves is not attempted here. However, profit and growth rates are analyzed using the variables that shift the curves. The actual observations would be at the intersection points of the *DG* and *SG* curves. Details of the equations and justification of the determinants considered will be discussed in subsequent sections. In this section the broad framework of the model and the identification of the jointly determined and predetermined variables will be presented.

Inter-firm variations in profits (*PRM* and *PRR*) will be determined by a set of variables that influence the shifts of the *DG* and *SG* curves. They include variables representing intangible assets created or acquired by the firm, like the variables representing technology creation and acquisition, skill intensity and marketing skill, international diversification (exports), internalization advantages as represented by vertical integration, size and age of the firm, capital-output ratio, and the growth of the firm. In addition, industry (intercept) dummies will also be introduced, as they are considered important in shifting *DG* curves. The model will consider the following technology variables: (1) successful technology creation as measured by their past R&D achievements represented by such variables as patents registered *PAT*, technology exported *TEX* (royalty and technical-fee receipts), and awards won for their R&D activities *AW*; (2) import of technology through the market *MT*, as measured by lump-sum, royalty, and technical-fee payments; and technology imports through intra-firm arrangement captured through foreign equity participation *FEQ*. All these variables except the growth of the firm will be considered predetermined, since these variables are likely to influence profits and not the other way round. It could be argued that advertising intensity *AD* would also depend on profit margins, and therefore cannot be considered predetermined. However, while it is true that advertising expenditures are largely financed by profits earned, it is not clear whether they are positively influenced by profits, since a firm with declining profits or even a firm suffering losses would like to step up its advertising outlay to improve profit rates as part of its corporate strategy. Hence, the causality appears to be from advertising to profits. Similarly in the case of technology imports, royalty and other payments are committed expenditures and cannot be influenced by short-term fluctuations in profits. On the other hand, they are incurred mainly to improve the firm's performance. Patents and successful technology exports would also influence profits and not the other way round.

Inter-firm variations in growth rates *G*, would depend, in addition to the variables that went into determining the profit rates, on both fixed and inventory investment rates and profit variables. Fixed investment in turn would be determined by profits, tax planning, external funds, age of the firm, and lagged investments, while inventory investment would be influenced by profits, inventory-sales ratio, vertical integration, and the availability of funds. On the other hand, external funds themselves would depend upon the size and the age of the firm, profits, vertical integration, and investments. Finally, dividend rates would mainly depend on past dividend policy and current profits. In addition, industry dummies have been introduced in all the equations.

The industry where the firm operates has been emphasized by Marris as one of the important factors responsible for differences in the *DG* curves or the environment in which it operates. Industries differ with respect to technological opportunities and growth prospects. To accommodate the industry factor, all the sample firms are classified into four broad industrial groups. The first group consists of firms operating in low technological opportunity, and traditional industries like food, textiles, jute, and leather. The other three groups consist of relatively high technology, modernized sectors, namely, chemicals, engineering, and processing. The first group of firms has substantially lower growth and profits compared to firms in the other three groups. The sample averages of growth, profit margins, and profit rates for the firms belonging to the four group are (1) traditional industries 8.485, 1.951, and 9.643; (2) chemical 11.463, 6.411, and 17.887; (3) engineering 13.077, 6.968, and 22.216, and (4) processing 16.95, 5.865, and 16.581, respectively. Three intercept dummies have been introduced to capture the impact of the three modernized industrial sectors.

A. *Variables and Their Definitions*

All the variables used in this study, except the variables relating to patents and awards won for R&D activities, have been taken from the Reserve Bank of India (RBI) data tapes entitled "Finances of Large Public Limited Companies." These tapes provide information on 300 variables for the top 500 corporations. Data on patents and awards have been taken from Ministry of Science and Technology publications.

1. *Jointly determined variables*

All the variables are three-year averages.

PRM = profit margin—total revenue minus total cost divided by total revenue; that is, gross profits as a percentage of sales turnover.

PRR = profit rate—gross profits plus interest payments as a percentage of financial counterpart of gross assets; that is, share capital plus reserves, plus borrowings.

PRM and *PRR* are weighted averages weighted by net sales or shareholders' capital plus borrowings as the case may be. In the Marris model these two variables are related. *PRR* is determined by *PRM* and *COR*.

G = percentage growth of sales turnover.

IF = fixed investment calculated as the change in gross fixed assets expressed as a ratio of capital stock.

INV = the change in the stock of inventories expressed as a percentage of sales.

ESF = external sources of finance—flow of funds during the year from all types of borrowings expressed as a ratio of sales.
DVD = amount of dividends paid to shareholders expressed as a ratio of sales.
GRP = gross retained profits; gross profit − DVD.
$I = IF + INV$.

2. *Predetermined variables*

AD = advertisement and other selling expenditures as a percentage of sales.
AGE = age of the firm defined as the ratio of depreciation reserves to gross fixed assets.
AW = dummy variable denoting awards won for R & D efforts.
$CHEM$ = dummy variable denoting chemical firms.
COR = capital-output ratio.
ENG = dummy variable denoting engineering firms.
FEQ = percentage share of foreign equity in total equity.
INS = total stock of inventory as a percentage of sales.
MT = import of technology as measured by royalty, technical fees, and lump-sum payments made to foreigners as a percentage of sales.

The RBI data tapes provide information on all these variables.

PAT = dummy variable denoting patents filed by firms. (This variable has been taken from the Ministry of Science and Technology publications.)
PRO = dummy variable denoting processing firms.
$SIZE$ = size of the firm in terms of sales turnover.
$SKILL$ = salaries paid to persons who earn more than Rs.3,000 per month as a percentage of total wages and salaries bill.
$TAXP$ = tax planning denoted by the ratio of tax incentives (depreciation plus development rebate) to investment in fixed assets.
TEX = dummy variable denoting technology exports.
VI = vertical integration denoted by value added as a percentage of sales.
X = exports as a percentage of sales.

In addition, the model also has the following lagged variables that are considered predetermined for estimation purposes: IF_{-1}, $SIZE_{-1}$, ESF_{-1}, and DVD_{-1}.

B. *The Model*

The model has two versions based on the two profit variables, PRM and PRR. The PRM specification is given below. For the other version one has to merely substitute PRR for PRM.

$$\begin{aligned} PRM = {} & a_{10} + a_{101}\log SIZE + a_{102}SKILL + a_{103}COR + a_{104}X \\ & + a_{105}VI + a_{106}G + a_{107}AD + a_{108}FEQ + a_{109}MT \\ & + a_{110}TEX + a_{111}AW + a_{112}PAT + a_{113}AGE \\ & + a_{114}CHEM + a_{115}ENG + a_{116}PRO + U_1. \end{aligned} \tag{1}$$

$$\begin{aligned} G = {} & a_{20} + a_{201}\log SIZE + a_{202}SKILL + a_{203}COR + a_{204}X \\ & + a_{205}VI + a_{206}PRM + a_{207}AD + a_{208}FEQ + a_{209}MT \\ & + a_{210}TEX + a_{211}AW + a_{212}PAT + a_{213}AGE + a_{214}CHEM \\ & + a_{215}ENG + a_{216}PRO + a_{217}IF + a_{218}INV + U_2. \end{aligned} \tag{2}$$

$$IF = a_{30} + a_{301}IF_{-1} + a_{302}PRM + a_{303}TAXP + a_{304}ESP + a_{305}AGE + a_{306}G + a_{307}CHEM + a_{308}ENG + a_{309}PRO + U_3. \tag{3}$$

$$INV = a_{40} + a_{401}PRM + a_{402}INS + a_{403}ESF + a_{404}VI + a_{405}CHEM + a_{406}ENG + a_{407}PRO + U_4. \tag{4}$$

$$ESF = a_{50} + a_{501}\log SIZE + a_{502}AGE + a_{503}VI + a_{504}PRM + a_{505}I + a_{506}CHEM + a_{507}ENG + a_{508}PRO + U_5. \tag{5}$$

$$DVD = a_{60} + a_{601}PRM + a_{602}DVD_{-1} + a_{603}CHEM + a_{604}ENG + a_{605}PRO + U_6. \tag{6}$$

$$GRP = \text{gross profit} - DVD. \tag{7}$$

In short, while discussing the profit growth trade-off and the shifting of growth of demand curves, Marris made a distinction between immediate environment of the firm as represented by the demand curve, and the super environment. Since different firms produce different products with their respective characteristics, they face different super environments and *DG* curves. Ultimately, however, the profit growth frontier is itself altered by fixed and other investment, innovative activity, and sophisticated marketing.

Variables representing innovative activity and marketing sophistication are usually treated in the literature as variables denoting product diversification and differentiation. Firms that succeed in creating new products and processes through successful technology creation and adaption (patents, awards, royalty receipts, and technology transfer), and those that communicate their new products and processes through advertising are better equipped to shift their *DG* curves.

III. DETERMINANTS OF FIRMS' PERFORMANCE: PROFIT AND GROWTH

Most of the earlier research has explained inter-firm differences in performance in terms of differences in firm size. The role of size in explaining profit margins and growth of firms is a complex one and evidence in this regard is mixed. Baumol [4] hypothesized a positive relationship between firm size and profit margins/rates, as large firms have an advantage over the smaller ones in the sense that the larger firms can enter into all the product lines that the smaller firms enter, while the reverse is not true due to the presence of size and scale advantages. Empirical evidence on the role of size in influencing a firm's performance whether considered in terms of profits or growth rates does not support Baumol's theoretical predictions.

A negative relationship between profit margins/rates and size was reported by Shepherd [30] for the top 231 U.S. firms, by Buckley et al. [7] for the top 500 corporations of the world, and by Kumar [20] for a sample of U.K. firms. Even with regard to growth and size the picture was not very different. Buckley et al. [7] did not find size to be an advantage for growth. Rowthorn and Hymer [28] (for the top 500 MNCs) and Siddharthan and Lall [32] (for the top U.S. MNCs) also found an inverse relationship between firm size and growth. Using panel data on publicly traded companies in the U.S. manufacturing sector, Hall [15] concluded that the previously observed negative relationships by most of the earlier authors was robust to corrections for selection bias and heteroscedasticity. Evans [13] found both size and age of the firm also negatively related to growth.

Many explanations have been given in the literature for these unexpected results, like X-inefficiency, diseconomies of scale, Penrose effects, etc. In our view, size happens to be a catchall variable that could capture effects of capital intensity, multinationality, vertical integration advantages or internalization advantages, innovative activity, etc. Therefore in this paper, these variables have been separately introduced to see whether size per se is important after taking into account these factors. Some of the earlier research has introduced variables representing multinationality [7] [32] [20]. Some studies have also introduced innovative activity of the firms and their advertising intensities in analyzing performance. However, variables representing vertical integration indicating internalization advantages and import of technology contributing to modernization and product diversification have yet to be introduced. It is hoped that after introducing these variables directly as explanatory variables, the impact of size per se could be captured and the results would be more easily interpretable.

Table I presents the two-stage least square results of the *PRM* version of our model, while Table II presents the *PRR* version. Some of the independent variables whose coefficients did not turn out to be statistically significant are excluded from the respective equations and are not reported in the tables. The results indicate that the size of the firm is an important determinant of *PRM*. Thus size advantages after taking into account the other variables appear to be important in influencing profit margins. However, size was not found important in explaining growth, and hence is not reported in the tables. Earlier results based on U.S. and European data found a negative relationship between size and performance as indicated by profits or growth. Our results are more in accordance with the original theoretical expectations, in particular with those of Baumol [4]. One of the reasons for our results being different from those of earlier studies could be that we have isolated the influence of other variables from that of size by introducing them directly. Capital intensity as captured through capital-output ratios is significant both in the profit and growth equations of the *PRM* and *PRR* versions. Capital intensity is negatively related to profits, but positively related to *G*. This result is in accordance with the Marris model. Growth of the firm along the *DG* curve would increase capital-output ratios affecting *PRM* and *PRR* adversely, but influence growth positively.

Vertical integration by exploiting the internalization advantages ought to influence profits positively. If it does not help profits, then there would be no internalization advantages and the firms would not adopt vertical integration. However, vertical integration does not enable the firm to diversify into other industries, which should contribute to growth. Hence, it need not be positively related to *G*. The results confirm both these hypotheses.

TABLE I

REGRESSION RESULTS: PRM VERSION

Independent Variables	Dependent Variables					
	PRM (1)	*G* (2)	*IF* (3)	*INV* (4)	*ESF* (5)	*DVD* (6)
Intercept	−19.8488***	2.0190	−0.0515***	−1.0877	4.6181***	0.0804**
	(−4.804)	(0.570)	(3.230)	(−1.370)	(5.264)	(2.521)
Log *SIZE*	0.7219**					
	(2.351)					
VI	0.5192***	−0.3363***		−0.0788**		
	(15.706)	(−2.989)		(−2.483)		
AGE		12.3630*	0.1047***			
		(1.952)	(3.430)			
COR	−3.8905***	2.6080*				
	(−6.944)	(1.966)				
X		−0.1758*				
		(−1.661)				
INS				0.1902***		
				(12.834)		
TAXP			0.3470***			
			(2.725)			
FEG	0.0363**					
	(2.432)					

TABLE I (Continued)

Independent Variables	Dependent Variables					
	PRM (1)	*G* (2)	*IF* (3)	*INV* (4)	*ESF* (5)	*DVD* (6)
MT	2.4652**					
	(2.183)					
AD		0.9931				
		(1.442)				
TEX		9.9102*				
		(1.937)				
IF_{-1}			0.5876***			
			(10.016)			
DVD_{-1}						0.7924***
						(39.887)
PRM		0.6354***	0.1811***	0.1680***	−0.3056***	0.0304***
		(3.711)	(3.095)	(3.896)	(−5.741)	(9.114)
G	0.3026***					
	(7.850)					
INV		0.4203**				
		(1.990)				
IF		0.3362**				
		(2.534)				

TABLE I (Continued)

Independent Variables	Dependent Variables					
	PRM (1)	*G* (2)	*IF* (3)	*INV* (4)	*ESF* (5)	*DVD* (6)
ESF			0. 1269	0. 0939**		
			(1. 367)	(2. 550)		
I					0. 7867***	
					(6. 600)	
CHEM	0. 5261	0. 6829	0. 0151*	−1. 3397***	0. 8468	−0. 0757**
	(0. 6371)	(0. 423)	(1. 836)	(−2. 671)	(0. 873)	(−1. 994)
ENG	3. 9077***	−0. 0803	0. 0122	−2. 0037***	0. 2324	−0. 0678
	(4. 434)	(−0. 042)	(1. 373)	(−3. 504)	(0. 213)	(−1. 618)
PRO	1. 9328*	4. 1347*	0. 0143	−0. 9009	1. 5682	−0. 0842*
	(1. 878)	(1. 961)	(1. 396)	(−1. 409)	(1. 280)	(1. 755)
$\bar{R}^2$	0. 5491	0. 3067	0. 6319	0. 4426	0. 2541	0. 9421

Note: *** Significant at 1 per cent level, ** at 5 per cent level, and * at 10 per cent level by two-tail test.

TABLE II

REGRESSION RESULTS: PRR VERSION

Independent Variables	Dependent Variables					
	PRR (1)	*G* (2)	*IF* (3)	*INV* (4)	*ESF* (5)	*DVD* (5)
Intercept	−5.9921	−7.3416**	−0.0646***	−2.8273***	6.9611***	−0.0673**
	(−0.643)	(−2.087)	(−4.001)	(−3.898)	(7.469)	(−2.017)
Log *SIZE*	0.9516					
	(1.438)					
VI	0.5100***	−0.3801***		−0.0549**		
	(7.153)	(−4.171)		(−2.171)		
AGE	−22.9112***	21.5709***	0.1183***			
	(−3.974)	(3.084)	(3.844)			
COR	−6.7815***	5.5338***				
	(−5.394)	(3.722)				
INS				0.1862***		
				(12.872)		
TAXP			0.3244**			
			(2.271)			
FEG	0.1115***	−0.0770**				
	(3.415)	(−2.124)				
MT	−0.3811					
	(−0.157)					

TABLE II (Continued)

Independent Variables	Dependent Variables					
	PRR (1)	*G* (2)	*IF* (3)	*INV* (4)	*ESF* (5)	*DVD* (6)
AD	2.0014***					
	(2.689)					
IF_{-1}			0.5902***			
			(9.463)			
DVD_{-1}						0.8730***
						(56.591)
PRR		0.7180***	0.1065***	0.1242***	−0.3073***	0.0131***
		(6.391)	(2.021)	(4.825)	(−8.483)	(7.438)
G	0.7569***					
	(7.630)					
INV		0.4107*				
		(1.859)				
IF		0.1806				
		(1.294)				
ESF			0.1303	0.1524***		
			(1.207)	(3.800)		
I					0.7924***	
					(6.635)	

TABLE II (Continued)

Independent Variables	Dependent Variables					
	PRR (1)	*G* (2)	*IF* (3)	*INV* (4)	*ESF* (5)	*DVD* (6)
CHEM	5.9446***	−2.9316	0.0108	−2.0680***	3.1804***	−0.1353***
	(3.329)	(−1.554)	(1.185)	(−3.804)	(3.052)	(−3.155)
ENG	4.3020**	−1.4148	0.0120	−2.0847***	1.4061	−0.1155**
	(2.253)	(−0.685)	(1.301)	(−3.722)	(1.266)	(−2.584)
PRO	2.0501	1.8287	0.0139	−1.1169*	2.5293**	−0.1019**
	(0.908)	(0.795)	(1.296)	(−1.753)	(2.041)	(−1.998)
$\bar{R}^2$	0.3413	0.1909	0.6138	0.4538	0.2462	0.9356

Note: *** Significant at 1 per cent level, ** at 5 per cent level, and * at 10 per cent level by two-tail test.

Technology imports both intra-firm (that is, foreign equity participation) and through the market against royalties, technical fees, and lump-sum payments, were found to be important in improving profits, but did not contribute to the growth of sales. In India for the period under consideration, technology imports were mainly for modernization and not for diversification into other activities, for which firms had to obtain a separate industrial licences. The procedure to obtain an industrial license to produce a new product through imported technology for an existing firm is complex and time-consuming. These provisions, however, have been liberalized since 1985. For firms with substantial foreign equity participation the procedures are even more complex. Investments by MNCs are highly regulated and restricted, hence *FEQ* would not be an advantage for growth under the early 1980s policy. However, diversification and growth are possible through in-house R & D. Government policy encourages commercialization of in-house R & D results. Hence the variable *TEX* indicating the output of R & D did turn out to be important in explaining growth in the *PRM* version. However, the other two indicators of R & D output, awards won and patents filed, were not important in explaining either growth or profits, and hence are not reported in the tables. While *TEX* is based on market evaluation, the other two are based more on subjective evaluations, and this could be one of the reasons for their turning out to be not significant. The industry dummies were significant in more than one equation, indicating that, by and large, chemical and processing industries enjoyed higher profits and growth after taking into account all the other variables.

The impact of exports on growth was found to be negative and significant at the 10 per cent level in Table I, but not significant in Table II. A similar result was obtained by earlier writers. Siddharthan and Dasgupta [31] found a negative relationship between profits and export intensities for a cross section of industries and attributed this to the advantages of selling in a highly protected domestic market. Most firms exported mainly to meet the export commitments imposed by the government, rather than to improve their profits. The results indicated that while the age of the firm was an advantage for growth, it was not so for profits. Older, more established firms grew faster in India compared to the newer ones during this period. Many of the government committees which were constituted to enquire into the working of the Indian industrial licensing system have come to similar conclusions. The licensing procedure acted as an entry barriers and encouraged the growth of the established older firms. With the liberalization that was introduced in 1985 and 1991, this result could also change.

IV. INVESTMENT BEHAVIOR

A. *Fixed Investments*

In the Marris model growth of supply is equated with the rate of investment. A firm's decision to invest in fixed assets has its theoretical underpinnings supported fully or partially by empirical findings [19] [18] [33] [26]. Most of these studies and the variables identified in them are of prime importance only in a purely intertemporal framework. What we are interested in is the differential investment behavior and how it accounts for inter-firm variations in growth and profits. Inter-firm variability in investment behavior could be caused by such factors as the liquidity position of a firm largely determined by profits, availability of external finance and tax planning, past investment commitments, age of the firm, demand conditions facing a firm, and industry specific factors. The results show that *PRM* and *PRR* are important in explaining fixed investment. Besides representing the finance constraint, profit rates and margins provide the necessary market signals to a firm for expanding capacity. Growth of sales did not turn out to be important and hence is not reported in the tables.

The results show that the lagged levels of fixed investment are important in determining the current levels of fixed investment, thereby confirming the literature [14]: that investment in fixed assets is a long-term decision, and because of adjustment costs, adjustment to desired stock of capital is not instantaneous.

Though the impact of tax incentives, concessions, and rebates on fixed investment has been questioned by Eisner and Nadiri [12], Hall and Jorgenson [16] bring out both analytically and empirically the importance of tax incentives in investment. Auerbach [3], however, raised some analytical issues in the context of joint-stock companies, but Williams [34] underlined the fact that in the case of less developed countries, firms were liquidity constrained, and in that context tax concessions would improve their internal resource position and promote investment in fixed assets. Using Indian data Pinell-Siles [25] and Sharma and Sondhi [29] demonstrated the importance of tax incentives in encouraging investment. The variable *TAXP,* used in this paper, is a composite variable, comprising development rebate and depreciation allowances as a ratio of fixed investment. The results support the hypothesis that tax incentives are instrumental in encouraging investment.

In a cross section sample of firms having capital stock of different vintages, it is desirable to introduce the age of the firm as an explanatory variable. The older the firm, the larger the replacement of worn-out capital. By establishing this nexus between age and fixed investment we do not rule out yet another type of causality. Older firms could be larger in size, too, with larger firms having comprehensive plans for expansion and modernization, and therefore larger levels of fixed investment. This result is also consistent with the one given in equation 2, where age was positively related to growth of sales.

B. *Inventory Investment*

Following Arrow et al. [2] the demand for inventories has been viewed as consisting of three components, namely, transactions demand, precautionary demand, and speculative demand; and the function was estimated, among others, by Rowley and Trivedi [27] and Pandit [24]. An alternative view is what is called the optimal stock criterion [27] [5], which takes into account all factors impinging on inventory demand, such as expected time profile of sales, interest rates, storage, and other costs. Across firms, variability in inventory investment could arise due to liquidity constraints, inventory-sales ratio, and degree of vertical integration.

The results show profits, inventory-sales ratio, external finance, and vertical integration to be important in determining inventory investment *INV*. Changes in inventories relative to average sales of firms were positively related to the average inventory-sales ratio levels. In a cross section sample of firms, inventory-sales ratio would differ among firms, since stock requirements could be firm activity specific. Though all investments, including inventory investments, are guided by considerations of future profits and influenced by inventory-sales ratio, any plan for inventory accumulation would be constrained by the availability of financing. Profits would indicate the availability of internal finance, while *ESF* represents external finance. Both turned out to be very important in determining *INV*.

It could be argued that the greater the degree of vertical integration, the smaller is the need to keep large unsold stocks of goods in process or as raw materials. In fact, some of the main internalization advantages are the quality of inputs and delivery timing and reliability that help in economizing inventory holdings. Economizing on inventory holdings would also contribute to higher profits. Therefore vertical integration should influence profits positively and inventory holdings negatively. Equations 1 and 4 presented in Tables I and II confirm both these hypotheses.

The industry dummy variables were significant for the engineering and chemical industries and had negative signs, implying that in both these industries inventory were less than in the rest. Since these two industries are relatively more modern and also because technological changes have been faster there than in other traditional raw material-based industries, it can be argued that modernization has led to optimization of inventory levels. Also, in India, the information revolution and computerization have penetrated these modern industries more than the traditional industries. Dudley and Lasserre [11] found evidence in favor of firms substituting information for inventories.

V. FINANCIAL DECISIONS

Fixed and inventory investments would depend significantly on the availability of finance. Internal funds can sustain only a certain level of growth as determined by the finance frontier. External funds would be essential if the desired rate of growth is higher than what is supported by internal funds. In this context choices relating to dividends, retained earnings, and external funds become important. A majority of the studies suggest that dividends is the active and primary decision variable, and consequently retained profits are residual in character [21] [8] [6] [1]. In this study also we assume dividends to be the primary decision variable and treat retained profits as residual. Following Lintner [21] we will consider lagged dividends and current profits as the main determinants of current dividends. As suggested by other research [9] [10] [6] [8], certain other variables like the growth of sales, flow of external funds, and working capital requirements could also be introduced in the equation.

The main explanatory variables turned out to be current profits and lagged dividends. This supports Lintner's hypothesis that the two parameters—namely, the target-payment ratio and the reaction coefficient of the dividend equation—subsume the impact of other variables like investment expenditures and the flow of external funds, working capital, etc. These variables, when introduced explicitly into the equation, were found to be statistically not significant and hence are not reported. All three industry dummies have negative signs, indicating that all three nontraditional industries have been keeping their dividend rates low in spite of high profits, probably for generating the internal funds required for growth.

Since the cost of retained profit is lower and there is less risk involved in the use of internally generated funds, the demand for external funds would arise whenever the demand for investment expenditure is in excess of what can be financed by internal sources. In this sense the demand for external funds is a residual demand and thus inversely related to the flow of internal funds or profit rates. The results reveal that total investment expenditures (fixed assets and inventories) are significant determinants of demand for external sources of funds. The profit variable is also significant and has a negative coefficient, as expected. Some other variables like vertical integration cost of funds and size of the firm were tried, but were not significant. In Table II chemical and processing industry dummies were significant with a positive coefficient. This result, together with the negative sign of these dummies in the case of equation 6, indicates a high preference for growth by these industries, which makes them cut down on dividends declared and increase investment through retained earnings and external source of funds.

VI. CONCLUSIONS

In this study an attempt has been made to analyze inter-firm variations in performance using the Marris managerial model framework. Differences in the profit and growth rates among firms are explained in terms of shifts in the demand for and supply of growth curves. An econometric model has been developed to explain growth, profits, investment, and financial choices of firms, and two-stage least square results are presented. The model brings out the interrelationships between these variables. Earlier studies have concentrated on testing one or two hypotheses that emerged from the Marris model, but so far no comprehensive model has been developed and tested.

The derived reduced-form equations and the impact multipliers for the two versions are presented in Tables III and IV. Variables denoting size and age of the firms, tax planning, foreign equity participation, import of technology through the market at arm's length, advertising intensity, and innovative activities influenced growth, profits, investment, and dividends favorably and reduced firms' dependence on external sources of funds. In the case of the size variable, earlier studies using samples of firms from developed countries did not find size to be an advantage for the firm performance. Our results differ from the earlier ones in this respect. Our results are also closer to the a priori theoretical expectations. The results further show that vertically integrated firms were able to exploit their internalization advantages, and as a result enjoyed higher profits and grew faster. In addition, they were able to economize both on their inventory holdings and

TABLE

DERIVED REDUCED FORM AND IMPACT

	Constant	*SIZE*	*VI*	*AGE*	*COR*	*X*	*INS*	*TAXP*
G	−19.1020	0.7024	0.01989	20.5707	−0.4091	−0.2276	0.120702	0.1514
PRM	−25.6296	0.9345	0.5252	6.2252	−4.0143	−0.0689	0.0365	0.0458
IF	−0.0867	0.0015	0.0007	0.1146	−0.0063	−0.0001	0.0003	0.0035
INV	−4.5689	0.1407	−0.0060	0.9457	−0.6044	−0.0104	0.2109	0.0072
ESF	8.7872	−0.1737	−0.1647	−1.0681	0.7462	0.0128	0.1550	−0.0056
DVD	−0.6988	0.0284	0.01597	0.1893	−0.1220	−0.0021	0.0011	0.0014
I	−4.6556	0.1422	−0.0053	1.0603	−0.6107	−0.0105	0.2112	0.0107

TABLE

DERIVED REDUCED FORM AND IMPACT

	Constant	*SIZE*	*VI*	*AGE*	*COR*	*INS*	*TAXP*
G	−32.9785	1.7446	−0.0365	14.6209	0.7796	0.2171	14.0502
PRM	−30.9520	2.2720	0.4823	−11.8458	−6.1915	0.1643	10.6340
IF	−0.0810	0.0017	0.0003	0.1095	−0.0047	0.0003	0.3328
INV	−4.7449	0.2002	−0.0199	−1.0276	−0.5456	0.2263	0.9817
ESF	12.6496	−0.5382	−0.1638	2.9129	1.4668	0.1291	−2.2265
DVD	−0.4724	0.0297	0.0063	−0.1550	−0.0810	0.0022	0.1392
I	−4.8259	0.2019	−0.0196	−0.9182	−0.5503	0.2266	1.3145

external use of funds. Here it is interesting to note that while the immediate impact of vertical integration on growth was negative (Tables I and II), the ultimate impact turned out to be positive on Table III.

The ultimate impact of *VI* on *G* would depend on the intensity of the initial impact of *VI* on *G*, its impact on *PRM*, and the impact of *PRM* on *G*. In Table I the impact of *VI* on *PRM* was positive, and *PRM* in turn influenced *G* favorably. The positive impacts of *VI* on *PRM* and of *PRM* on *G* were stronger than the initial negative impact of *VI* on *G*. Hence, the overall impact is positive in Table III. On the other hand, in the *PRR* version presented in Table IV, the ultimate impact of *VI* on *G* remains negative because of the strong initial impact of *VI* on *G* in Table II. In Table II the initial impact of *VI* on *G* was much stronger than in Table I. In the Marris model *PRR* and *PRM* are related. In particular, *PRR* is determined by *PRM* and capital-output ratio. In other words, unlike *PRR*, *PRM* does not take into account capital intensity. Moreover, since the denominator of *PRR* included the financial counterpart of gross capital—that is, capital financed by equity, shareholders' reserves, and borrowings—the numerator included profits and interest payments. The inclusion of owned and borrowed capital in the gross capital estimations and the consequent inclusion of interest payments in profits would account for differences in the results between the *PRM* and *PRR* versions with regard to some of the variables. However, the *PRM* version could be preferred, since the estimation of the *PRR* variable involves

III

MULTIPLIERS (PRM VERSION)

FEG	*MT*	*AD*	*TEX*	IF_{-1}	DVD_{-1}	*CHEM*	*ENG*	*PRO*
0.0353	2.3954	1.2855	12.8280	25.6278	0.000	1.3032	3.0508	7.4664
0.0470	3.1910	0.3890	3.8821	7.7556	0.000	0.9204	4.8309	4.1923
0.0001	0.0050	0.0006	0.0061	0.6005	0.000	0.0163	0.0180	0.0221
0.0071	0.4805	0.0586	0.5845	1.2147	0.000	−1.2199	−1.4119	−0.1812
−0.0087	−0.5932	−0.0723	−0.7216	−0.9418	0.000	−0.3817	−2.3408	0.1618
0.0014	0.0970	0.0118	0.1180	0.2358	0.7924	−0.0477	0.0791	0.0433
0.0071	0.4855	0.0592	0.5906	1.8151	0.000	−1.2036	−1.3939	−0.1591

IV

MULTIPLIERS (PRR VERSION)

FEG	*MT*	*AD*	IF_{-1}	DVD_{-1}	*CHEM*	*ENG*	*PRO*
0.0205	−0.6986	3.6693	25.5626	0.000	2.6987	2.9288	8.0171
0.1270	−0.9098	4.7786	19.3472	0.000	7.9871	6.5187	8.1179
0.0001	−0.0007	0.0036	0.6055	0.000	0.0191	0.0166	0.0225
0.0112	−0.0802	0.4211	1.7862	0.000	−1.0951	−1.5513	−0.1142
−0.0301	0.2155	−1.1320	−4.0509	0.000	−0.1268	−1.8133	−0.0382
0.0017	−0.0119	0.0625	0.2532	0.8730	−0.0307	−0.0302	0.0044
0.0113	−0.0809	0.4247	2.3917	0.000	−1.0760	−1.5346	−0.0917

the usual problems encountered in the valuation of capital stock. From the point of view of empirical estimation, *PRM* is less controversial.

Capital intensity does not appear to be an advantage for the firms in the Indian context. The coefficient of the capital-output ratio was negative for profits, investments, and dividends in both versions, and for growth in the *PRM* version. In the Marris model, any increase in the capital-output ratio would adversely affect profits, but not growth. It should influence growth positively, but profits negatively. Our results presented in Tables I and II confirm this. However, as seen from Table III, the ultimate impact of capital deepening appears to be negative, even on growth. This is because of the negative influence it has on profits, investment, and dividends. The sum total impact therefore turns out to be negative. In Table III the ultimate impact turns out to be negative, since the initial impact of *COR* on *G* is relatively weak in Table I compared to Table II. However, in Table IV (*PRR* version) the strong positive initial impact dominates the indirect impact, and the overall impact remains positive. Export intensities also consistently affected all variables negatively, confirming our hypothesis that firms undertake exports because of government pressure. Given the protected nature of the Indian market, and the complexity of restrictions and the consequent monopoly rental enjoyed by large Indian firms at home, it was more profitable to exploit the protected domestic market than to venture into exports. The results further indicate that the engineering, chemical, and processing industries enjoyed higher profits and growth and declared more dividends, but that the economized on inventories and depended less on external sources of finance compared to firms that operated in the traditional sectors, like textiles, jute; and metal-based industries.

The study indicates that if Indian firms wish to simultaneously increase their growth and profit rates, they ought to diversify and move into more modern, technology-intensive sectors like the chemicals, engineering, and processing industries, reap the internalization advantages through vertical integration, make their operations technology more intensive through import of technology via both arm's length and intra-firm methods rather than making their operations capital intensive, and finally improve their tax planning.

REFERENCES

1. AGARWAL, R. N. *Corporate Investment and Financing Behaviour: An Econometric Analysis of Indian Automobile Industry* (Delhi: Commonwealth Publishers, 1987).
2. ARROW, K. J.; KARLIN, S.; and SCARF, H. *Studies in the Mathematical Theory of Inventory and Production* (Stanford, Calif.: Stanford University Press, 1958).
3. AUERBACH, A. J. "Taxation, Corporate Financial Policy and the Cost of Capital," *Journal of Economic Literature,* Vol. 21, No. 3 (September 1983).
4. BAUMOL, W. J. *Business Behavior, Value and Growth* (New York: Macmillan Co., 1959).
5. ————. *Economic Theory and Operations Analysis* (New Delhi: Prentice Hall of India, 1978).
6. BRITTAIN, J. A. *Corporate Dividend Policy* (Washington, D.C.: Brookings Institution, 1969).
7. BUCKLEY, P. J.; DUNNING, J. H.; and PEARCE, R. D. "The Influence of Firm Size, Industry, Nationality and Degree of Multinationality on the Growth and Profitability of the World's Largest Firms, 1962–72," *Weltwirtschaftliches Archiv,* Vol. 114, No. 2 (1978).
8. DARLING, P. G. "The Influence of Expectations and Liquidity on Dividend Policy," *Journal of Political Economy,* Vol. 65, No. 3 (June 1957).
9. DHRYMES, P., and KURZ, M. "Investment, Dividends and External Finance Behavior of Firms," in *Determinants of Investment Behavior,* ed. R. Ferber (New York: National Bureau of Economic Research, 1967).
10. DOBROVOLSKY, S. P. *Corporate Income Retention* (New York: Nationa lBureau of Economic Research, 1951).
11. DUDLEY, L., and LASSERRE, P. "Information as a Substitute for Inventories," *European Economic Review,* Vol. 33, No. 1 (January 1989).
12. EISNER, R., and NADIRI, M. I. "Investment Behavior and the Neo-classical Theory," *Review of Economics and Statistics,* Vol. 50, No. 3 (August 1968).
13. EVANS, M. K. "A Study of Industry Investment Decisions," *Review of Economics and Statistics,* Vol. 49, No. 2 (May 1967).
14. HAAVELMO, T. *A Study in the Theory of Investment* (Chicago: University of Chicago Press, 1960).
15. HALL, B. H. "The Relationship between Firm Size and Firm Growth in the US Manufacturing Sector," *Journal of Industrial Economics,* Vol. 35, No. 4 (June 1987).
16. HALL, R. E., and JORGENSON, D. W. "Application of the Theory of Optimal Capital Accumulation," in *Tax Incentives and Capital Spending,* ed. G. Fromm (Washington, D.C.: Brookings Institution, 1971).
17. HAY, D. A., and MORRIS, D. J. *Industrial Economics and Organization: Theory and Evidence,* 2d ed. (Oxford: Oxford University Press, 1991).

18. JORGENSON, D. W. "The Theory of Investment Behavior," in *Determinants of Investment Behavior*, ed. R. Ferber (New York: National Bureau of Economic Research, 1967).
19. KOYCK, L. M. *Distributed Lags and Investment Analysis* (Amsterdam: North Holland Publishing Co., 1954).
20. KUMAR, M. S. *Growth, Acquisition and Investment: An Analysis of the Growth of Industrial Firms and Their Overseas Activities* (Cambridge: Cambridge University Press, 1984).
21. LINTNER, J. "Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes," *American Economic Review*, Vol. 46, No. 2 (May 1956), Papers and Proceedings.
22. MARRIS, R. "A Model of the 'Managerial' Enterprise," *Quarterly Journal of Economics*, Vol. 77, No. 2 (May 1963).
23. ————. *The Economic Theory of Managerial Capitalism* (London: Macmillan Co., 1964).
24. PANDIT, B. L. "A Note on Inflation and Corporate Investment," *Indian Economic Review*, Vol. 18, No. 2 (July–December 1983).
25. PINELL-SILES, A. "Determinants of Private Industrial Investment in India," *World Bank Staff Working Papers*, No. 333 (Washington, D.C.: International Bank for Reconstruction and Development, 1979).
26. PRECIOUS, M. *Rational Expectations, Non-Market Clearing and Investment Theory* (Oxford: Oxford University Press, 1987).
27. ROWLEY, J. C. R., and TRIVEDI, P. K. *Econometrics of Investment* (London: John Wiley, 1975).
28. ROWTHORN, R. and HYMER, S. *International Big Business 1957–1967: A Study of Comparative Growth* (Cambridge: Cambridge University Press, 1971).
29. SHARMA, J. V. M., and SONDHI, H. K. *Investment Allowances: A Study* (New Delhi: National Institute of Public Finance and Policy, 1989).
30. SHEPHERD, W. G. "The Elements of Market Structure," *Review of Economics and Statistics*, Vol. 54, No. 1 (February 1972).
31. SIDDHARTHAN, N. S., and DASGUPTA, A. K. "Entry Barriers, Exports, and Inter-Industry Differences in Profitability," *Developing Economies*, Vol. 21, No. 1 (March 1983).
32. SIDDHARTHAN, N. S., and LALL, S. "The Recent Growth of the Largest US Multinationals," *Oxford Bulletin of Economics and Statistics*, Vol. 44, No. 1 (February 1982).
33. TOBIN, J. "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit and Banking*, Vol. 1 (February (1969).
34. WILLIAMS, R. L. "Tax Incentives and Economic Behavior in Developing Countries," *Public Finance*, Vol. 32, No. 1 (1977).