ENTRY BARRIERS, EXPORTS, AND INTER-INDUSTRY DIFFERENCES IN PROFITABILITY

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I. INTRODUCTION

STUDIES on market structure and profitability have so far concentrated on developed industrialized countries in general and on the United States in particular.[1] There has been little attempt to analyze the determinants of inter-industry differences in profits in a developing country. India clearly offers a good case for study from this point of view; for not only is India one of the largest developing countries in terms of population and area, it has also acquired a strong industrial base since independence, with a wide range of both consumer goods and capital goods production. Furthermore, among the developing countries, India is one of the best endowed in high-level skilled manpower.

Compared with the developed countries, India also shows a number of special features which could have relevance for the analysis of industrial behavior. In the first place, there is a strong element of government control of the economy. The domestic banking sector is nationalized, while the government has sought to regulate private industry by industrial licensing and price and quantity controls of production and distribution. Second, the overall strategy has been one of import substitution and the policies followed have been strongly protectionist. In consequence, producers in both the public and private sectors of industry faced almost no foreign competition, such competition as there was, being only between Indian firms.[2] Third, except in textiles and agro-industry, industrial development in India has been largely a post-independence phenomenon and its history is short, though eventful.

In all these respects, Indian industry differs markedly from that of the developed economies on which the literature on inter-industry profit differences has been based. It is of interest, therefore, to find out whether the explanatory variables which have been put forward in that literature [11] [5] [18] [12] [13] as determining inter-industry profit variation, viz., traditional entry barrier variables such as size and scale economies, research and development (R & D) ex-

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[1] For a good survey of literature, refer to Hay and Morris [7].

[2] Domestic competition was often quite limited. Bhagwati's account of the typical situation in a number of developing countries [3] is particularly relevant for India.

penditure, and advertisement intensity, continue to have significant explanatory power in the very different environment of the Indian economy of the mid-1970s. Whether the distinctive features of this economy are likely to affect the explanatory power of the entry barrier variables, and if so, in what direction, cannot be established at all clearly by a priori reasoning. Thus it could be argued that in a situation where the government is important both as producer and consumer of industrial products, the role of advertisement and of product differentiation generally would be relatively small; and the fact that many industries are new industries, as well as the existence of wide regional disparities in patterns of demand, markets often being local rather than national, probably tends to have a similar effect. On the other hand, the lack of a strong preexisting industrial culture and the dearth of modern industrial entrepreneurial (though not of technical/engineering) skills, might well lead to barriers on new entry being more rather than less effective.

This paper attempts to use data on a cross section of industries in India for the period 1975–78 to explain inter-industry differences in profitability. Apart from being, to the best of our knowledge, the first such study based on Indian data, it differs from previous studies in at least two important respects.

The first relates to our choice of the skill variable. Indian data, unlike the U.S. or the U.K. data, enable one to obtain the proportion in the total wage and salary bill in each industry of the remuneration to higher-paid staff. We have taken this to represent the proportion of higher technical and managerial staff in the total work force of the industry concerned and used it as the skill variable in our regression analysis. We believe this to be a significant improvement in the sense that it captures the skill effect better than those previously used in the literature, for example, the average industry wage rate or the ratio of salaries to wages which may be affected more by the power and bargaining position of trade unions than by skill levels as such.

The second point concerns our analysis of the influence of the foreign trade sector on the profitability of Indian industries. Here it is necessary to take into account the influence of exchange control and other trade regulations that have been in force. This would be particularly relevant, for example, in interpreting a regression coefficient of exports on profits. In India, unlike developed countries such as the United Kingdom and developing countries such as the Republic of Korea, firms may often desire to export only in order to fulfil certain commitments to the government, rather than to pursue profits, which may well be higher for domestic sales, given a seller's market and protection from foreign competition. This could be attributed to the element of compulsion in the government's export policy. Large firms are granted industrial licences to produce goods on explicit export commitments. Firms in certain industries are not given foreign exchange to import raw materials, unless they fulfil their export commitments. Multinational corporations are permitted to invest mostly on the basis of export commitments, i.e., only if they agree to export a specified percentage of the output. These policies could lead to a negative relationship between profitability and exports as opposed to the standard trade theoretic considera-

tions, which would suggest a positive relationship. Our analysis seeks to emphasize this aspect, which is specific to India and certain other developing countries.

The plan of the paper is as follows: Section II deals with the analytical framework and discusses the main hypotheses to be tested. Section III describes the sample and its characteristics and defines the variables used in the analysis. Section IV analyzes the statistical results and presents our main conclusions.

II. ANALYTICAL FRAMEWORK AND THE HYPOTHESES

Under perfect competition (which implies free entry), inter-industry differences in profits are expected to disappear in the long run. The same result would also hold under monopolistic competition of the kind analyzed by Chamberlain. Empirical work, on the other hand, has found that differences in profitability in industries tend to persist. Such differences were explained at first in terms of a single variable affecting industries, namely, the extent of concentration.[3] Bain's seminal work [1] showed that it was not concentration as such, but rather, barriers to entry which were crucial for differences in profit rates to continue. Bain's results were confirmed by much subsequent work. For example, Mann's study [11] found entry barriers to be an important determinant of differences in profitability between a sample of thirty U.S. industries. Similarly, Comanor and Wilson [5] attempted to specify the appropriate entry barrier variables and related them to profit rates for forty-one U.S. industries. Their statistical results suggested that both advertisement and absolute capital requirements were important in explaining inter-industry profit differences; concentration, growth of demand, and economies of scale were not. The importance of advertizing, as an explanation of entry barriers, was also stressed by Caves [4] who related both advertisement and R & D expenditures to product differentiation and hence to barriers to entry. However, he argued that in the absence of R & D, even a high degree of advertisement intensity might not succeed in achieving successful product differentiation. Accordingly, he recommended the use of both variables rather than that of advertisement in isolation. This argument finds support in the work of Orr [12] [13], who found advertisement to be significant when used with R & D in explaining the determinants of entry; and in that of Siddharthan and Lall [17] who found advertisement to be significant if used with R & D in a multiplicative form. On the other hand, Porter [14] found entry barrier variables including advertisement intensity and minimum economies of size to be significant only for larger firms; for his sample of smaller firms, he found them either to be insignificant or with the wrong signs.

In explaining the price-cost margins of industries in the United Kingdom, Khalilzadeh-Shirazi [10] introduced exports and imports as additional explanatory variables along with those representing product differentiation, size, and the growth of demand. He found that exports were positively, and imports were

[3] For survey of the relevant works, refer to Hay and Morris [7].

negatively related to profits.[4] Both the product differentiation variable and exports were found to be significant in explaining profitability but concentration was not.

Thus, by and large, the following explanatory variables have been used in the earlier studies to explain inter-industry differences in profits: expenditure on advertisement as a proportion of sales, expenditure on advertisement per firm, R & D expenditure as a proportion of sales, the average size of the firm (in some studies the average size of the firms that account for the top 50 per cent of the industry measured in terms of sales or employment has been used), the share of industry output accounted for by a plant of minimum efficient scale, the rate of growth of sales, concentration (share of top four or eight firms in the industry's shipments), exports and imports absolutely or as a proportion of sales. Of these variables, growth of sales, scale economies, and the concentration ratios did not turn out to be important in most of the studies.

In the Indian case, data on concentration and scale economies at the plant or enterprise level are not available. Even in the British case no direct estimate of minimum efficient plant scale was available and Khalilzadeh-Shirazi [10] had to content himself with a proxy. The Indian data does not even permit that. Hence, entry barrier variables representing minimum economies of scale had to be omitted. For the purpose of this study we constructed concentration ratios ($C4$) based on the share of the top four corporations in each industry. Certain problems were encountered in constructing $C4$ based on the firms' sales revenue data as most of the firms were multi-product ones. These problems are discussed in Appendix B.

In addition to the entry barrier and export variables that are generally discussed in the literature, we propose to study the impact of inter-industry differences in skill levels on profits. Caves [4] considers differences in skill levels to be an important source of monopolistic advantage, accruing to firms in industries where skill levels are high. However, he considers this variable in the context of direct foreign investment and assumes that these monopolistic advantages could be transferred to foreign locations. We have included this variable in the determinants of profitability, as this advantage should show up even more in the companies' profitability. Caves suggested three variables that could act as proxies: (i) the percentage of non-production workers to total workers, (ii) average pay per worker, and (iii) wages per production worker. As stated earlier, we have taken the proportion in the total wages and salary bill of the remuneration to higher paid staff as a measure of the skill level; for this purpose, higher paid staff was defined as those paid more than Rs. 3,000 per month.[5]

[4] Apart from Khalizadeh-Shirazi, the influence of foreign competition on domestic industries' profitability was also analyzed by Eposito [6].

[5] Employees' earning more than Rs. 3,000 per month are regarded as belonging to senior management cadre, technical or administrative, with high skills; and companies are required to publish names, salaries, and qualifications of all such employees.

III. THE SAMPLE AND DEFINITION OF VARIABLES

This study is based on data relating to medium- and large-scale public limited companies operating in thirty industries (Appendix A) for the period April 1, 1975 to March 31, 1978. The data is taken from the *Reserve Bank of India Bulletin* of May 1980. Smaller public limited companies, partnership firms and individual proprietory concerns are not included in the sample, which consists of medium- and large-scale firms only. The omission of the smaller firms need not be entirely a disadvantage, for the profit behavior of larger firms may well be different from that of the smaller ones. Thus in Porter's study of various industries [14], many of the industry-level product differentiation and entry barrier variables, while they influenced the larger firms favorably, were found to affect the smaller ones adversely. In such circumstances, an analysis which considers large-scale firms and small-scale firms separately would give more meaningful results. However, it is true that, had data been available for the smaller firms for the same industrial classification, we could have fitted the equations for the second sample also and compared the results. The data do not permit this to be done.

The period of the sample, 1975 to 1978, more or less coincides with the period of national emergency, except for a few months in the beginning and at the end. During this period there were few strikes and lockouts, and the level of industrial discipline was relatively high. Hence our results on inter-industry differences in profits would be less liable to be distorted by the incidence of industrial disputes.

All the variables are averages of three years and i denotes the industry subscript, taking the values from 1 to 30.

PR_i = profit after tax as a percentage of net worth. This definition of profit is in line with most of the previous studies mentioned in Section II. We have taken net worth as equal to share-holders' capital plus share holders' reserves.

GS_i = growth of sales revenue of industry i during the period 1975–78.

AD_i = expenditure on advertisement as a percentage of sales revenue.

RD_i = expenditure on R & D as a percentage of sales revenue.

$SIZE_i$ = the average size of firms in the industry.

$SKIL_i$ = remuneration to employees earning not less than Rs.36,000 per annum as percentage of salaries, wages, and bonus of all employees.

EXP_i = export earnings as a percentage of sales revenue.

$C4$ = percentage share of top four firms in the industry output.

As already mentioned, all the variables except $C4$ have been taken from the *Reserve Bank of India Bulletin* of May 1980. All the variables except *SIZE* are either proportions or growth rates. Accordingly, in line with normal practice, we have considered size in the logarithmic form.

TABLE I

CORRELATION MATRIX

	GS	*AD*	*RD*	*SKIL*	*PR*	*EXP*	Log *SIZE*	*C4*
GS	1.000							
AD	0.211	1.000						
RD	0.042	0.095	1.000					
SKIL	0.246	0.265	0.321	1.000				
PR	0.195	0.334	0.231	0.619	1.000			
EXP	−0.181	−0.071	−0.131	−0.352	−0.536	1.000		
Log *SIZE*	−0.218	−0.345	0.112	0.237	0.144	0.068	1.000	
C4	−0.23	−0.322	−0.170	0.212	0.007	0.062	0.464	1.000

IV. STATISTICAL RESULTS

We start by commenting on the interrelationship between the variables as seen from the correlation matrix in Table I. There appears to be no serious problem of multicollinearity, except in the case of the skill variable which, as expected, is generally correlated with most of the other independent variables. The correlation is particularly strong with respect to *RD* and exports. R & D intensive industries also happen to be highly skill intensive. But the correlation between *RD* and profitability is not strong (0.231), while that between skill and profitability is fairly high (0.619). In other words, difference in skill levels is one of the major determinants of profitability, while difference in research intensity is not. This could partly be due to the fact that most of the R & D units are new and most of the firms did not have R & D units in the late sixties. Since there is always a time lag between R & D investment and its influence on product differentiation and profitability, we were not able to capture the impact in the analysis.

The skill variable is also related to export intensity, but the sign of the correlation coefficient is negative. In fact export is negatively related to most of the other explanatory variables. Indian exports, as seen from the correlation matrix at present, appear to be mostly from low technology, low skill, and low entry barrier industries. This finding seems to go well with traditional international trade theory.[6] However, it is not clear whether this is due to factor endowment and comparative advantage or to market distortions introduced by the industrial and licensing policies of the government.

The correlation between *C4* and profitability was very low (0.007) and it was not significant in any of the equations. Therefore the equations that included *C4* are not reproduced in Table II. However, the correlation coefficients between *C4* and other independent variables are interesting. *C4* is positively correlated with *SIZE*. The correlation between *SIZE* and *C4* is 0.551 and between *C4* and log *SIZE* is 0.464. This is not unexpected but what is unexpected is the

[6] The empirical evidence on this is rather mixed. For a recent work on this, refer to Ray [15].

TABLE II

STATISTICAL RESULTS

Equation Number	*CONS*	AD_i	RD_i	$SKIL_i$	EXP_i	Log *SIZE*	*GS*	R^2	$\bar{R}^2$	*F*
1.	−15.62	4.241	1.412	1.003	−0.686	2.441	0.014	0.556	0.440	4.804
	(1.03)	(1.66)	(0.11)	(1.99)	(2.63)	(1.09)	(0.12)			
2.	−14.98	4.253	1.366	1.017	−0.688	2.38		0.556	0.463	6.009
	(1.08)	(1.71)	(0.11)	(2.13)	(2.70)	(1.11)				
3.	−18.31	6.214	7.629		−0.889	4.086		0.472	0.388	5.591
	(1.24)	(2.51)	(0.59)		(3.51)	(1.93)				
4.	− 4.80			1.340	−0.642	0.765		0.501	0.444	8.718
	(0.38)			(3.08)	(2.48)	(0.39)				

correlation between *C*4 and *AD* which turns out to be negative (−0.332). This could be because industries where the share of the top four firms is very high, do not advertize; at very high levels of concentration, collusion is more likely than competition. It could also reflect some characteristics of our sample. Thus, for example, basic metal industries turn out to be very highly concentrated, and since product differentiation is not very high in these industries, the value of *AD* could be low. *C*4 is also positively correlated with *SKIL*, but the value of the coefficient is not high (0.212).

In Table II equation (1), all the determinants of profitability were considered. Only skill and export intensity turned out to be significant in explaining profitability. This could be because of intercorrelations between skill and the product differentiation variables. The *t* value for the growth of sales was very low, so it was dropped from the rest of the equations. *RD* and *AD* were also tried in a multiplicative form but this did not improve the results, so the equation is not reported here. Along with log *SIZE*, $\log^2$ *SIZE* was also tried but was not significant.

In equation (2) the *t* values of all coefficients improved after dropping the growth variable. Nevertheless probably because of multicollinearity with skill, the product differentiation variables were still not statistically significant. So in equation (3), the skill variable was dropped while in equation (4) *AD* and *RD* were dropped. In equation (3), *AD*, *EXP*, and *SIZE* turned out to be important in explaining the rate of profits. In equation (4), skill together with exports was important in explaining profitability.

From these results, the inter-industry differences in skill turn out to be the most important determinant of profitability. It was significant in all equations where it was tried. The correlation between skill and *RD* intensity is positive but low in magnitude.

RD did not turn out to be an important determinant of profit rates. In earlier studies *RD* was not directly related to profitability. It was related to entry barriers by Orr [12] [13]; and entry barrier index related to profitability. In the Indian case, R & D units were new and therefore were yet to make an impact on profitability. Growth of sales was also not significant; in this respect, the Indian experience is in accordance with the international experience. In most of the earlier studies too, the growth variable was not important.

Size was important only in the absence of the skill variable. Up to a point size is supposed to influence profits positively; beyond this, diseconomies of scale are likely to set in. Therefore, this variable is usually introduced in a non-linear form. The quadratic term in our equation, however, was not statistically significant.[7] Our results on the relationship between size and profitability at the industry level thus turn out to be inconclusive.

As in the case of the Western developed economies, in the case of India too, *AD* turns out to be an important determinant of profits. Thus, even in the Third World countries, advertisement may be an important entry barrier that promotes higher profits.

In all our equations, the exports variable is significant and has a negative sign, which supports the hypothesis stated earlier that the Indian exporters did not export in response to higher profits but were obliged to do so under governmental regulations and contracts.

By and large, the results presented in this paper are in conformity with earlier studies, except in respect of export and skills. The skill variable representing monopolistic advantages, though sometimes introduced in growth and international investment equations, has generally been ignored in profit equations. In the Indian case it turns out to be the most important determinant of profitability. However, while industries' exports in the United Kingdom were found to be positively related to profits, in India their influence is negative. The reasons for this have been discussed earlier in this paper. It is possible that one of the important entry barriers in India is the government's industrial licensing instrument itself, even though one of the objectives of the licensing policy is to prevent concentration. However, it was not possible to quantify and capture its impact in a study based on a cross section sample and an industrial classification that is not detailed enough to capture the licensing categories.

[7] Siddharthan [16] found a quadratic relationship between size and profitability for a sample of firms belonging to the Indian engineering industry. The relationship was significant for the analysis based on firm level data.

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APPENDIX A

THE SAMPLE INDUSTRIES

1. Edible vegetable and hydrogenated oils.
2. Sugar.
3. Other food products.
4. Tobacco.
5. Cotton textiles.
6. Jute textiles.
7. Silk and rayon textiles.
8. Woollen textiles.
9. Breweries and distilleries.
10. Aluminum.
11. Other nonferrous metals (basic).
12. Transport equipment excluding motor vehicles.
13. Motor vehicles.
14. Electrical machinery, apparatus, appliances, etc.
15. Machinery other than transport and electrical.
16. Foundries and engineering workshops.

17. Ferrous/nonferrous metal products.
18. Chemical fertilizers.
19. Dyes and dyestuffs.
20. Man-made fibers.
21. Other basic industrial chemicals.
22. Medicines and pharmaceutical preparations.
23. Paints, varnishes, and other allied products.
24. Other chemical products.
25. Cement.
26. Rubber and rubber products.
27. Paper and paper products.
28. Glass and glassware.
29. Printing and publishing.
30. Industrial and medical gases.

APPENDIX B

NOTE ON *C*4

For countries like the United States and the United Kingdom, the variable *C*4 is available from the census of manufacture and is calculated by the concerned organizations based on the share of the top four plants or enterprises in the output of the industry. In those publications the industrial classification followed for this purpose is either four or five digit ones. Unfortunately this information is not available in India. However, the sales turnover of the top 300 companies is available. It is possible to classify these 300 largest companies in terms of the industrial classification followed in this paper. The assumption here is that the top four firms in each industry would find a place in the top 300 of the corporate sector. Since the industrial classification used in this paper is fairly broad, multi-product firms might not create serious problems. These assumptions held for most of the sample industries. However, in some cases we encountered certain problems. Sugar and brewery products were by and large produced by the same set of firms. Since the product mix was not available at the firm level, we decided to use the same *C*4 values for both these industries. The top four firms producing woollen textiles, paints, and gases were not large enough to be found in the top 300 corporations. Therefore, for these three industries, we calculated *C*4 based on the individual industry studies conducted by the Monopolies Inquiry Commission [9]. The industry sales are taken from the *Annual Survey of Industries* [8, various issues], which includes all enterprises, both large and small.