

**SHIFTING OF THE CORPORATION
INCOME TAX IN INDIA**

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CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS.....	(1)
LIST OF TABLES.....	(vii)
LIST OF FIGURES.....	(x)
 <u>Chapter</u>	
1 INTRODUCTION.....	1
1.1 Purposes of Taxation.....	1
1.2 Impact, Shifting, and Incidence of Taxes.....	2
1.3 Choice of the Tax to be Analysed...	4
1.4 Objectives and Scope of the Study..	7
1.5 Layout of the Study.....	7
 2 SHIFTING AND INCIDENCE OF CORPORATION INCOME TAX: THEORY.....	 10
2.1 Problems of Definition.....	10
2.1.1 Incidence and Effects.....	11
2.1.2 Public Expenditures and Incidence..	13
2.1.3 Partial Versus General Equilibrium Approach to Incidence.....	15
2.1.4 Shifting in the Present Study.....	18
2.2 Shifting of Corporate Income Tax Under Different Markets.....	19
2.3 Monopoly.....	20
2.4 Oligopolistic Models.....	22
2.4.1 Collusive Oligopoly.....	22
2.4.2 Price Leadership.....	24
2.5 Non-Profit Maximizing Models.....	27
2.6 Scitovsky-Boulding Model.....	28

<u>Chapter</u>		<u>Page</u>
	2.7 Average-Cost Pricing.....	32
	2.8 Bain's Limit-Pricing Models.....	39
	2.9 Baumol's Sales Maximization Hypothesis.....	45
	2.10 Managers' Utility-Maximising Behaviour.....	49
	2.11 Signal Theory.....	53
	2.12 General Observations.....	56
	2.13 Backward Shifting.....	59
3	EMPIRICAL ANALYSIS OF THE SHIFTING AND INCIDENCE OF CORPORATE INCOME TAX.....	60
	3.1 Empirical Studies on Countries Other Than India.....	61
	3.1.1 Simple Statistical Studies.....	61
	3.1.2 Econometric Studies.....	65
	3.1.3 Simultaneous Equations Estimations.....	93
	3.1.4 Industry Studies.....	99
	3.1.5 General Equilibrium Studies.....	106
	3.1.6 Other Shifting and Incidence Studies on Corporate Income Tax.....	116
	3.2 Empirical Studies in India.....	117
	3.2.1 Ambirajan's Study.....	117
	3.2.2 The Study by Lall.....	121
	3.2.3 Application of K-M Model to India..	126
	3.2.4 The Gandhi Contribution.....	130
	3.2.5 The Mathew Study.....	135
	3.2.6 The Contribution of Rao.....	138
	3.2.7 The General Equilibrium Analysis...	141
	3.3 General Observations.....	144
4	THE PRELIMINARY EMPIRICAL ANALYSIS.....	147
	4.1 The Model.....	149
	4.2 Measures of Shifting.....	154
	4.2.1 Data Availability.....	155
	4.2.2 Nature of the Data.....	157

<u>Chapter</u>		<u>Page</u>
	4.3 Rationale for an Industrywise Study of Shifting.....	163
	4.3.1 The Selected Industries.....	164
	4.4 The Re-estimated Equations.....	166
	4.4.1 The Laumas Equations.....	167
	4.4.2 The Gandhi Equations.....	171
	4.4.3 The Rao Equations.....	174
	4.5 The Choice of Specification.....	177
5	A SUGGESTED METHOD FOR ESTIMATING THE DEGREE OF SHIFTING.....	182
	5.1 Incorporation of Non-Financial Variables.....	182
	5.2 The Tax Rate Question.....	191
	5.3 Problems of Using L_t and the Solution.....	192
	5.4 The Shifting Estimates.....	196
	5.5 The First-Difference Equations.....	200
6	POSSIBLE LAGS IN THE TAX EFFECT.....	204
	6.1 The General Lag Structure.....	205
	6.2 OLS with a Cut-off Year.....	205
	6.2.1 The Trial Estimation.....	206
	6.3 The Application of Koyck Scheme....	209
	6.4 Results.....	214
7	INTERPRETATION OF THE RESULTS AND POLICY IMPLICATIONS.....	226
	7.1 Shifting Groups.....	226
	7.2 Profiles of the Selected Industries	228
	7.2.1 Sugar.....	229
	7.2.2 Iron and Steel.....	234
	7.2.3 Tea Plantations.....	242
	7.2.4 Paper.....	246

<u>Chapter</u>	<u>Page</u>
7.2.5 Cement.....	249
7.2.6 Aluminium.....	253
7.2.7 Cotton Textiles.....	256
7.3 The Possible Presence of a Pattern.	260
7.4 Policy Implications.....	262
APPENDIX TABLES.....	269
SELECT BIBLIOGRAPHY.....	300

LIST OF TABLES

<u>Table No.</u>		<u>Page</u>
1.1	Revenue from the Corporation Income Tax.....	5
1.2	Revenue from Major Taxes: 1974-75 and 1979-80	6
4.1	Re-estimated Y^E Equations (Laumas for the Years 1954-55 to 1974-75.....)	168
4.2	Regressions Estimated Using Gandhi Specifica- tion for the Years 1955-75.....	172
4.3	Regression Results Using the Rao Equations for the Years 1955-75.....	175
5.1	Regression Results with One/Two Variables Added to the Gandhi Specification for the Chosen Industries.....	186
5.2	Coefficients of Z_t in the Preferred Equations	192
5.3	Results of the Iterative Regressions for Y^E (Equity Base).....	197
5.4	Shifting Estimates Using L_t and Z_t	198
5.5	Results of the Iterative Regressions in First-Difference Form.....	201
6.1	Estimated Y^E (Equity Base) Equations for the Selected Industries with Two Lagged Values of the Tax Rate.....	208
6.2	Simple Correlation Coefficients of the Tax Rates Used in Table 6.1.....	209
6.3	Results Which Yielded the Highest Values of R^2 with Different Values Assigned to b_0 and A during the First Round.....	215

<u>Table No.</u>		<u>Page</u>
6.4	Results Which Yielded the Highest Values of R^2 with Different Values Assigned to b_0 and λ during the Second Round.....	216
6.5	Various Estimates of Industrywise Shifting for the Seven Selected Industries.....	223
7.1	Degree of Shifting and Other Characteristic Features of the Seven Selected Industries....	261
A.1	Financial Data for Sample Companies: Tea Plantations.....	272
A.2	Financial Data for Sample Companies: Sugar...	273
A.3	Financial Data for Sample Companies: Cotton Textiles.....	274
A.4	Financial Data for Sample Companies: Iron and Steel.....	275
A.5	Financial Data for Sample Companies: Aluminium	276
A.6	Financial Data for Sample Companies: Paper and Paper Products.....	277
A.7	Financial Data for Sample Companies: Cement.	278
A.8	Financial Data for Sample Companies: Whole Corporate Sector.....	279
B.1	Financial Ratios: Tea Plantations.....	280
B.2	Financial Ratios: Sugar.....	281
B.3	Financial Ratios: Cotton Textiles.....	282
B.4	Financial Ratios: Iron and Steel.....	283
B.5	Financial Ratios: Aluminium.....	284
B.6	Financial Ratios: Paper and Paper Products..	285
B.7	Financial Ratios: Cement.....	286
B.8	Financial Ratios: Whole Corporate Sector....	287

(ix)

<u>Table No.</u>		<u>Page</u>
C.1	Tea Plantations in India, 1955-75.....	288
C.2	Sugar Industry in India, 1955-75.....	289
C.3	Cotton Textile Industry, 1955-75 (Mill Sector)	290
C.4	Performance of Iron and Steel Industry in India.....	291
C.5	Production of Aluminium in India, 1955-75....	292
C.6	Paper and Paper Board Production, 1955-75....	293
C.7	Cement Production in India, 1955-75.....	294
C.8	National Aggregates and Ratios, 1955-56 to 1974-75.....	295
D	Non-Financial Variables Used in the Regressions.....	297
E	Growth of Corporate Sector in India, 1950-75.	299

LIST OF FIGURES

<u>Figure No.</u>		<u>Page</u>
1	Seitovsky-Boulding Model.....	29
2	Short-Run Cost Curves.....	34
3	Average-Cost Pricing.....	37
4	Limit-Pricing.....	42
5	Baumol's Sales Maximisation Hypothesis...	46
6	Managers' Utility-Maximisation Model of Williamson.....	51
7	Shifting Under Signal Theory.....	54

CHAPTER 1

INTRODUCTION

"All things pass and change except death," wrote St. Jerome from the desert; and a mordant humorist of our latter-day civilization duly added the words 'and income tax'. To verify the universality of our attitudes to taxation one has only to observe from daily experience how the mildest of men, normally modest of speech and restrained in expression, will fling themselves into hyperbole at the mere mention of taxation. Taxes are never 'burdensome' but invariably 'crippling'; they are never 'high' but invariably 'swingeing'; they are never 'undesirable' but invariably 'iniquitous'. Taxation doth make orators of us all."¹ Edward Nevin wrote the above passage about England, but it is equally applicable to India and many other countries.

1.1 Purposes of Taxation

What are the purposes of taxation? The obvious purpose is to collect revenues to enable the government to perform the functions it is entrusted with by the people; but it is equally obvious that collecting revenues is not the sole or even major purpose of taxation—there are other ways in which the government can raise funds. The economic functions of

¹ Edward Nevin, "Taxation for Growth—A factor Tax," Westminster Bank Review, November, 1963, p. 13.

taxation are basically three: proper allocation of resources, equitable redistribution of income and wealth, and ensuring stable growth. The last is actually a combination of two functions: stabilization of the economy and achieving maximum growth permitted by the various constraints. Whenever there is a conflict between these two objectives, the preference for one over the other is governed by the position the economy finds itself in. Generally speaking, a more developed economy would be more concerned about stability whereas a less developed economy would give more emphasis on growth. A tax must serve at least one of these purposes without—as far as possible—coming into conflict with the others. Otherwise, it cannot be called a desirable tax.

1.2 Impact, Shifting, and Incidence of Taxes

Before we see the relevance of shifting apropos these functions of taxation, a few definitions are in order. The legal taxpayer is said to bear the impact of the tax. However, the legal taxpayer may not actually be paying the tax, i.e., it may be collecting the tax from some other person(s), either explicitly or implicitly. An example is that of sales tax; the retailer bears the impact, but he collects it explicitly from the consumers. The process of passing on the tax burden to some other person(s) than the legal taxpayer by the same is called shifting. In the earlier example, shifting is explicit; but it can be implicit also, and the total of explicit and implicit shifting gives the true degree of shifting.

In the example cited, adding the sales tax to the price of the sales explicitly does not necessarily mean that sales tax is always shifted; one has to take into account the implicit shifting also which cannot be so readily perceived. This shifting process may be repeated. The person(s) on whom it finally comes to 'roost', or settle, is(are) said to bear the incidence of the tax.

It is clear that to have an idea about how far the various taxes serve the three functions outlined earlier, a knowledge about its incidence is essential. All the three objectives, reallocation of resources, equity and stable growth—interconnected in themselves—are affected by the incidence pattern, because an unintended incidence pattern may defeat the purpose of a particular tax and may even create additional complications. As an illustration, suppose a particular tax is levied on a monopolist-monopsonist to appropriate a portion of its monopoly profits; but it succeeds in shifting the tax backwards, i.e. on to the factors of production and the incidence falls on, say, labour. Not only is the purpose of curbing monopoly profits defeated, but also the wages are caused to fall, which is certainly not considered desirable. A blissful ignorance of the incidence of this particular tax will result in the continuous infliction of a cruel wrong on the labourers.

The above example amply demonstrates the need for incidence analysis. Shifting becomes important by association, because the analysis of shifting is the first step in the direction of finding out the incidence pattern.

1.3 Choice of the Tax to be Analysed

The choice of the particular tax to be analysed was governed by two factors: the sheer importance of the tax in the total tax structure in India in terms of revenue and the inconclusiveness of the answer to the shifting question given by various researchers.

Table 1.1 gives an idea about the revenue importance of the tax. In 1950-51 the corporation tax revenue was 6.46 per cent of the total tax revenue collected by the Centre and the States and 0.42 per cent of the national income. By 1960-61 it was 8.20 per cent and 0.84 per cent respectively. In 1970-71 these figures stood at 7.82 per cent and 1.08 per cent. By 1974-75 these figures were 7.71 per cent and 1.22 per cent respectively. This gives a broad idea about the general importance of the tax.

Taking all the Union Government taxes (excluding states' share) only, corporate income tax accounted for 11.34 per cent, 15.21 per cent, 15.11 per cent, and 13.92 per cent in the years 1950-51, 1960-61, 1970-71 and 1974-75 respectively in the total tax revenue. The dependence of the Central Government on this tax can be judged easily from this. The relative importance of corporate income tax can be judged from Table 1.2 also.

It can be seen from the table that in 1974-75, corporation income tax was fifth in terms of revenue yield. The relative position was higher in 1979-80 and it was the fourth highest-yielding tax among all taxes levied by the Centre or

Table 1.1 : Revenue from the Corporation Income Tax

Year	Revenue from Corporate Tax (Rs.crores)	National Income (Rs.crores)	Total Tax Revenue (Centre + States) (Rs.Crores)	(2) as per cent of (3)	(2) as per cent of (4)
(1)	(2)	(3)	(4)	(5)	(6)
1950-51	40.49	9530	626.60	0.42	6.46
1951-52	41.41	9970	731.04	0.41	5.66
1952-53	43.80	9820	691.98	0.45	6.33
1953-54	41.54	10480	693.58	0.40	5.99
1954-55	37.33	9610	736.50	0.39	5.07
1955-56	37.04	9980	767.61	0.37	4.83
1956-57	51.18	11310	889.49	0.45	5.75
1957-58	56.13	11390	1047.31	0.49	5.36
1958-59	54.33	12600	1090.66	0.43	4.98
1959-60	106.56	12950	1219.86	0.82	8.74
1960-61	111.05	13263	1354.92	0.84	8.20
1961-62	156.46	13987	1537.95	1.12	10.17
1962-63	221.50	14795	1854.93	1.50	11.94
1963-64	274.59	16977	2313.39	1.62	11.87
1964-65	314.05	20001	2585.22	1.57	12.15
1965-66	304.84	20637	2902.37	1.48	10.50
1966-67	328.90	23848	3239.64	1.40	10.15
1967-68	310.33	28054	3423.00	1.11	9.07
1968-69	299.77	28607	3727.22	1.05	8.04
1969-70	353.39	31606	4182.3	1.12	8.45
1970-71	370.5	34412	4734.8	1.08	7.82
1971-72	472.1	36728	5565.5	1.29	8.48
1972-73	557.9	40391	6432.7	1.38	8.67
1973-74	582.6	50498	7362.7	1.15	7.91
1974-75	709.5	59417	9206.5	1.19	7.71

Source: Report on Currency and Finance (various issues), Reserve Bank of India, Bombay; Estimates of National Income (various issues) and National Income Accounts Statistics (various issues), Central Statistical Organisation, New Delhi.

Table 1.2 : Revenue from Major Taxes: 1974-75 and 1979-80

Tax	1974-75		1979-80 (R.E.)	
	Revenue (Rs. Crores) (1)	Per cent to Total (2)	Revenue (Rs. crores) (3)	Per cent to Total (4)
1. Income Tax	874.4 ^a	9.50	1320.0 ^a	7.71
2. Corporation Income Tax	709.5	7.71	1380.0	8.06
3. Central Excise	3230.5 ^a	35.09	5825.2 ^a	34.04
4. Wealth Tax	39.2	0.42	63.0	0.37
5. Estate Duty	10.5 ^a	0.12	13.0 ^a	0.08
6. Gift Tax	5.1	0.05	6.2	0.04
7. Land Revenue	160.5	1.74	116.2	0.68
8. Agricultural Income Tax	13.9	0.15	69.3	0.40
9. Customs Duties	1332.9	14.48	2814.0	16.44
10. Sales Tax	1606.3 ^b	17.45	3302.6 ^b	19.30
11. State Excise	401.9 ^b	4.36	670.5 ^b	3.92
12. Vehicle Tax	179.3 ^b	1.95	381.2 ^b	2.23
13. Tax on Goods and Passengers	151.0 ^b	1.64	276.2 ^b	1.61
14. Electricity Duty	91.3	0.99	215.9	1.26
15. Stamps and Registration Fees	219.0 ^b	2.38	367.4 ^b	2.15
16. Entertainment Tax	125.5	1.36	225.1	1.32
17. Profession Tax	2.1	0.02	54.7	0.32
Total Tax Revenue (Centre + States)	9206.5	100.00	17115.2	100.00

a - Gross of States' share. b - Central plus States.

Source: Reserve Bank of India, Report on Currency and Finance, 1975-76 and 1979-80.

States (combined). A tax of such proportions naturally has a great effect on the economy and requires cautious handling.

Unfortunately, despite a large number of studies on the shifting and incidence of this particular tax in India and abroad, the issue is still wide open. Various studies have added to our understanding of the complexities involved; but the final answer still eludes us. Therefore, until the issue is settled to the satisfaction of the majority of the people concerned, there is and will be scope for additional work on this particular topic.

1.4 Objectives and Scope of the Study

The objective of this study, generally speaking, is to contribute towards a better measurement of the corporation income tax shifting in India. Specifically, the objective is to measure the short-run shifting of the tax at a disaggregated level. This includes refining the technique of such measurements and also to check for any lags in the shifting process.

The scope, naturally, is quite limited, though within that limited scope, the issues are quite complex. It is limited by the facts that we are interested in only one tax; that we are interested to find out shifting only, not incidence; that we are interested in finding out 'short-run' shifting only; and that we are primarily interested in a disaggregated analysis. All these, of course, are explained in the following chapters.

1.5 Layout of the Study

*Corporate taxation falls under the category of direct

taxation as it is levied on profits and not on output or turnover and is theoretically expected to rest on the companies on which it is levied. The assumption behind the thesis is that companies will so conduct their business and determine their price-policy as to maximize their profit and there can be therefore no question of shifting its burden either on consumers of their products or on their employees."² Is this really true, even granting the assumption? Moreover, is the assumption itself applicable always? What happens if it is not? The assumption of profit maximization is by no means a necessary one as many of the recent pricing theories show. Since our analysis is a positive (as opposed to normative) one, supposed to analyse what actually takes place, the behavioural assumption also has to be as realistic as possible.

In the following chapters we go into the question of the shifting of the corporation income tax. First, we see what answer(s) theory provides us with. Various types of market and various behavioural assumptions are considered. Next, a critical review of the empirical studies on this problem is undertaken. These include studies on both Indian as well as foreign corporate sector. Then the methodology of the present estimation of shifting, description of the data used and its sources, and the preliminary results are given.

² V.K.R.V. Rao, Foreword to V.G. Rao, The Corporation Income Tax in India, Concept Publishing Co., New Delhi, 1980, p. vi.

Next, we suggest a modified version of the usual method to measure shifting and use it to estimate the degree of shifting in the selected industries. The question of possible lags in shifting is examined next. The last chapter is devoted to the interpretation of the results and policy implications.

CHAPTER 2

SHIFTING AND INCIDENCE OF CORPORATION INCOME TAX: THEORY

In the previous chapter (Section 1.2) we had defined and described three important concepts: impact, shifting and incidence. However, there are certain important issues involved in the meaning of the last two concepts which we did not go into. Before we launch our discussion on the shifting and incidence of corporation income tax, at least a brief discussion of these issues seems to be in order. We will concentrate on the concept of incidence because that of shifting is closely related, and hence need not be discussed separately. Any decision as to the concept of incidence automatically implies a decision on the concept of shifting to be employed.

2.1 Problems of Definition

So far as the general definition of incidence given in the previous chapter is concerned, there is no controversy at all. But the controversy begins the moment we try to make that definition operational. How does one decide as to who finally bore the burden of the tax? Theoretically, the answer seems to be simple. One only has to find out the ceteris paribus change in the income distribution to find out whose income was reduced as a result of the tax. However, the matter is not really so simple.

2.1.1 Incidence and Effects

The first controversy was over the distinction between incidence and effects. Incidence was defined as the change in the distribution of income as a result of the tax whereas effects referred to any other change, e.g., in consumption pattern, in resource allocation, etc. This distinction dates back to early nineteenth century. Despite criticisms of this conceptualization,¹ it continued to hold sway even upto the middle of the present century. Of special importance is the fact that the term 'income' meant money income only. This is attested by one of the popular definitions of incidence in earlier years - that given by Hugh Dalton: "... the incidence is upon those who bear the direct money burden of the tax".²

However, the controversy again surfaced in the forties with Duncan Black renewing the attack on this distinction.³ He supported Cannan's observation that "persons who pay a tax are often less injured by its imposition than those who pay no portion of it. The man who goes two miles out of his way daily to avoid a bridge toll would be more benefited by the freeing of the bridge than most of those who pay the toll. It is,

1 Edwin Cannan, Memorandum Relating Chiefly to the Classification and Incidence of Imperial and Local Taxation, Royal Commission on Taxation, London, 1899, pp. 165-167.

2 Hugh Dalton, Principles of Public Finance, Allied Publishers, New Delhi, 1978, p. 36.

3 Duncan Black, Incidence of Income Taxes, Macmillan, London, 1939, pp. 122-124. See also J.A. Stockfisch, "On the Obsolescence of Incidence," Public Finance, Vol. 14, No. 2, 1959, pp. 125-150.

therefore, far better to consider the effects of taxation".⁴
The logic seems to be unassailable.

In due course of time, a sort of compromise was reached. It was realized that all effects cannot be analysed simultaneously, but nor can the sort of effect described by Cannan (which was ignored by the traditional definition of incidence) be ignored. Hence, the compromise reached was that incidence should measure the change in the economic welfare of the people resulting from the tax. The closest substitute of economic welfare which was measurable in quantitative terms was real income. Thus, incidence came to mean changes in real income distribution resulting from a tax. The reason for retaining the concept of incidence seems to be mainly three: (a) it is too well-established to be summarily rejected; (b) the concept of effects is too wide and many-sided to be analysed fruitfully; and (c) it is convenient for the analysis of equity of a particular tax or the tax system. As Musgrave puts it, rejecting the concept of incidence altogether is like "throwing out the baby with the bath".⁵ The present concept thus takes into account effects other than the 'direct money burden', but only if they result in a change in the real income distribution. The most vivid description of the present-day concept of incidence is probably given by Due: Incidence is "the manner in which the burden of the tax is finally allocated as among

4 Cannan, op.cit., p. 166.

5 Musgrave, Richard A., The Theory of Public Finance, McGraw-Hill Kogakusha, Tokyo, 1959, p. 227 (footnote).

various groups in the economy. This can be determined only after consideration of all readjustments which occur as a result of the tax, including such secondary reactions as changes in the prices of the factors."⁶

2.1.2 Public Expenditures and Incidence

The second problem arises out of the treatment of public expenditure. The traditional view has been to ignore this aspect of a tax altogether. Many economists, particularly the Italian school represented by De Viti de Marco in the English-speaking world, have criticised this approach heavily. They argue that a tax, after it is collected, is not thrown into the sea but spent by the government. Just as the tax burden is borne by some individuals, the public expenditures resulting from the tax benefit some individuals also. To deny this is to deny the fact that taxes and government expenditures are two sides of the same coin. As such, the incidence of a particular tax should not only calculate the distribution of the real burden of the tax, but also the distribution of the real benefits of the change in public expenditure generated by the tax and the net change in real income distribution should be called incidence.

There is obviously great merit in this argument. But here again there is a practical difficulty in implementing this suggestion while calculating incidence. It is a Herculean task to find out for which purpose exactly the proceeds of the

⁶ John F. Due, "The Incidence of Retail Sales Taxes," Bulletin of the National Tax Association, Vol. 25, May, 1940, p. 226.

tax were spent and calculate the incidence of that portion of public expenditure. The monetary policy question is also intertwined with this, because ignoring public expenditures implies the assumption of constant public expenditures and a tax in this framework obviously reduces the aggregate demand and is clearly indicative of deflationary policy. Hence the incidence is a joint effect, that of the tax as well as monetary policy.

Musgrave sidesteps the whole controversy by defining three concepts of incidence: specific tax incidence, differential tax incidence and balanced-budget incidence.⁷ Specific tax incidence is the distributional effect of the tax only whereas balanced-budget incidence is the concept suggested by the critics of specific tax incidence, i.e. the incidence of a tax change and the resultant change in public expenditures taken together. Differential tax incidence, a concept used by Wicksell first,⁸ is an ingenious way of avoiding the problems related to both the other concepts. It measures the change in distribution when one tax of equal yield is substituted for another. Although Musgrave's personal favourite is the concept of differential incidence, he suggests that any of the three concepts could be used depending on the purpose of the analysis, provided it is used consistently. Thus, the present situation is that one is free to use any concept of incidence (vis-a-vis

7 Musgrave, op.cit., pp. 211-215.

8 Ibid., p. 213 (footnote).

public expenditures) if the use is justified in view of the type of analysis being done.

2.1.3 Partial Versus General Equilibrium Approach to Incidence

It would probably be proper to deal with another important theoretical issue here, viz. that of the partial equilibrium approach versus general equilibrium approach in the analysis of incidence.

"Partial equilibrium analysis refers to the study of a specific market, such as the market for the output of some industry. It examines the direct effects of the tax within this market and tends to ignore the secondary effects occurring in other markets. ... why do we employ an analysis that ignores some effects? Basically, it is because economists believe these secondary effects are usually sufficiently small, uncertain and spread over so many other industries that we may legitimately concentrate on the taxed industry where the effects are likely to be most significant. More importantly, the secondary effects are unlikely to have a feedback effect on the taxed industry that would upset our conclusions concerning that market."⁹

The quotation above catches the distinguishing feature of the partial equilibrium and also spells out the rationale behind it, which is not always appreciated. General equilibrium

⁹ Edgar K. Browning, and Jacqueline M. Browning, Public Finance and the Price System, Macmillan, New York, 1979, p. 283.

analysis, taking into account the effects of a tax on the taxed as well as the untaxed industries, has been applied to the field of taxation comparatively recently,¹⁰ and like all innovations, its proponents have tended to overlook the utility of the earlier approach. Partial equilibrium analysis does have its shortcomings: it does not take into account the relative prices of factors and products by ignoring untaxed sectors where a tax may have its secondary effects, which may yield completely misleading conclusions. It is particularly misleading for a broad-based tax like an excise or income tax. The demand and supply conditions in one market are influenced by the situations in other markets where such broad-based taxes have equally strong effects. Moreover, it ignores the use to which the yield from a particular tax is put to completely.

However, the weaknesses of general equilibrium analysis are points in favour of partial equilibrium one. By the very nature of it, this sort of "analysis of a tax change explicitly

10 The exact period when it caught on is difficult to locate but it probably started with an article by Musgrave. See Musgrave, R.A., "General Equilibrium Aspects of Incidence Theory," American Economic Review, May, 1953, pp. 504-517. However, its first application for an empirical study and formalization was by Arnold C. Harberger, "The Incidence of Corporate Income Tax," Journal of Political Economy, June 1962, pp. 215-240. An early appreciation of general equilibrium aspects is evidenced in Ricardo's writings: while talking of profits taxes, he concludes that they will raise prices and "in the case of commodities taxes, profits would be raised above the general level, and capital would be moved from one employment to another, till an equilibrium of profits was restored, which could only be after the relative prices were altered." See David Ricardo, The Principles of Political Economy and Taxation, J.M. Dent & Sons, London, 1955, p. 135.

takes into consideration the changes in price and quantity that occur in all markets (for both goods and factors) as a result of the change. In the real world this would be a mammoth task due to the large number of markets that actually exist. For the purpose of analysis we must therefore abstract from the real world by assuming that the economy consists of a manageable number of markets for goods and factors.¹¹ The usual method is to use a two-sector, two-factor model. But even with such a model there are a great number of parameters whose values are necessary to find out the incidence of a tax. For example, the elasticities of substitution of capital for labour in both sectors are necessary to find out how far a taxed factor flows out of the taxed sector. Similarly, elasticity of demand for the taxed product, capital intensity in each of the sectors, are other parameters. Given the aggregative nature of the model, there are practically no handy estimates available for such parameters. Of necessity, certain plausible values have to be assumed. For very specific taxes, where we have reason to believe that the secondary effects in other industries will not be substantial, partial equilibrium analysis does the job well enough without going into the problems mentioned above.

As for the proper approach to analyse the incidence of corporate income tax, there seems to be a general agreement that such a broad-based tax, affecting almost certainly all

11 Robin W. Boadway, Public Sector Economics, Winthrop, Cambridge (Mass.), 1979, pp. 299-300.

sectors of the economy, should be analysed in general equilibrium terms, even though it is a sector-specific as well as factor-specific tax.

2.1.4 Shifting in the Present Study

In this study, we confine our attention to shifting, that is our analysis is limited to find out whether the corporate income tax reduces the real income of any other group besides the taxed group, i.e., the companies. In other words, we want to see whether the tax burden is completely borne by the companies themselves or not. What happens to the untaxed sector is not our immediate concern here, and hence a partial equilibrium analysis is enough for the present purpose.

As for the underlying concept of incidence, it is difficult to classify it into any of the three concepts. It could be called differential incidence, corporate income tax substituting a perfectly neutral tax. However, we actually compare the "with-tax" situation with a "no-tax" situation, other things remaining the same. The last proviso implies that public expenditure remains the same even without the tax, necessitating some change which puts the fund equivalent to the proceeds of the tax in the hands of the government. That means all other things cannot remain the same. If the alternative source of funds is deficit financing, the underlying incidence concept would be specific tax incidence. But if it is public expenditures which are allowed to fall in response to the abolition of the tax, the framework is that of balanced-budget incidence.

Among the three, differential incidence concept seems to be the most suitable, because it allows us to abstract from the problem of constancy or otherwise of public expenditures. The "no-tax" situation then represents a system with an alternative tax which is neutral as regards to the distribution of income.

2.2 Shifting of Corporate Income Tax Under Different Markets

In the rest of this chapter a review of literature on the short-run shifting of corporate income tax is presented. Some of the studies referred to below do not specifically analyse corporate income tax but a general profits tax. Their conclusions are examined making suitable modification, wherever necessary, to make them applicable to a partial profits tax, viz. the corporate income tax, which is not applicable to all profits and hence not a general profits tax. We start with the traditional analysis of its incidence under the assumption of perfect competition in both product and factor markets.

Under perfect competition, output and price are fixed by the intersection of MR (-AR) curve and the marginal cost curve which yields the maximum total profits. The standard assumption being that firms are only price takers and have no control over their price, the only thing it can vary in the short run is output. However, any output other than the optimal one would yield smaller profits. Therefore, as long as the tax rate is less than unity, it pays for the firm to produce the same optimum output even after the tax, since maximizing

before-tax profits maximizes after-tax profits also. Thus, the firms have to bear the tax burden themselves and there can be no shifting. This, in essence, is the traditional position.

There is a serious flaw in this argument. The implicit assumption here seems to be that the tax affects only the profits and nothing else. If we recall that the cost curve is drawn in such a way as to include the opportunity cost of capital or normal profits, this assumption is not true. There is no exemption limit for the corporation income tax¹² and hence, this part of the costs is taxed. Thus, this may cause reduction in output and lead to rise in price, thereby indicating at least partial shifting.

2.3 Monopoly

A monopolist, like a competitive firm, is also assumed to be maximizing profits. Its total revenue and total costs can both be expressed as functions of output:

$$R = R(q); \quad C = C(q)$$

His profit is the difference between his total revenue and total cost:

$$\pi = R(q) - C(q) \quad \dots(2.1)$$

To maximize π , the derivative of (2.1) with respect to q is set equal to zero:

¹² Some new industrial undertakings and also shipping and hotel companies are given 6 per cent exemption on capital employed, provided they fulfil certain conditions. For poultry and livestock breeding, the exemption is Rs. 10,000 or one-third of total profits, whichever is higher. See Income Tax Manual (Part 1), Sections 80J and 80JJ.

$$dx/dq = R'(q) - C'(q) = 0 \quad \dots (2.2).$$

(2.2) simply shows that when $R'(q)$ or marginal revenue is equal to $C'(q)$ or marginal cost, the profit is maximized.

If there is a tax,

$$x = (1 - t) [R(q) - C(q)] , \quad \dots (2.3),$$

t denoting the tax rate. The derivative of (2.3) is set equal to zero:

$$dx/dq = (1 - t) R'(q) - (1 - t)C'(q) = 0$$

$$\text{or, } (1 - t)R'(q) = (1 - t)C'(q)$$

$$\text{or, } R'(q) = C'(q).$$

The maximization condition remains unchanged. Thus, the same output is produced at the same price and hence there cannot be any shifting.

However, even here the observation about the normal profit being taxed and hence pushing up MC curve leading to shifting applies.

Besides, it has been pointed out that a monopolist need not be a profit maximizer always. Instead, it may consider a certain rate of return, say 15 per cent, as enough and adjust its output and price accordingly. The reasons for such behaviour may be many, like creating goodwill by changing a lower price than optimum, fear of competition, fear of attracting government antimonopoly measures and so on. With the imposition (or increase in the rate) of tax, it will have enough grounds to justify raising prices and keeping its rate of return intact and will try to do so. How far it succeeds

will depend on the extent of unexploited monopoly power and the (increase in) rate of tax.

2.4 Oligopolistic Models

It is generally recognized that perfect competition and monopoly are two polar cases and the market situations in the real world lie somewhere between these two extremes. However, despite this realization there is no well-accepted and well-defined set of theories explaining these cases.

In this section, we examine a few oligopoly models which try to give a theory for such in-between cases with a relatively lower degree of competition. In many industries 'competition among a few' describes the market situation correctly and hence such models and the shifting implications derived therefrom are likely to be useful.

We will deal with various oligopoly models which accept the traditional hypothesis of profit-maximization as an assumption first and discuss the other oligopoly models in the next section.

2.4.1 Collusive Oligopoly

The first model we will discuss is that of collusive oligopoly. The assumption here is that all the oligopolists in the market maximize their profit jointly and thereby optimize individual profits taking the price indicated by such joint profit maximisation. In essence, it is similar to the case of a multiplant monopolist.

For simplicity, let us assume the duopoly case. The

objective is to maximize profits:

$$\pi = \pi_1 + \pi_2,$$

given $P = f(X) = f(X_1 + X_2)$, and

$$C_1 = f_1(X_1), \quad C_2 = f_2(X_2),$$

where π denotes profits, P denotes price, X denotes output and C denotes costs. The subscripts stand for the two firms.

Denoting total revenue by R ,

$$\pi_1 = R_1 - C_1 \text{ and } \pi_2 = R_2 - C_2.$$

Therefore, $\pi = R_1 + R_2 - C_1 - C_2 = R - C_1 - C_2$.

The market marginal revenue is

$$dR/dX = \partial R / \partial X_1 = \partial R / \partial X_2,$$

that is, each additional unit will bring the same MR, irrespective of the firm in which it is produced, since all units of X are sold at the same price.

The first order conditions for maximisation of joint profits π will be

$$\partial \pi / \partial X_1 = \partial R / \partial X - \partial C_1 / \partial X_1 = 0$$

$$\text{and } \partial \pi / \partial X_2 = \partial R / \partial X - \partial C_2 / \partial X_2 = 0,$$

or, $\partial R / \partial X = \partial C_1 / \partial X_1 = \partial C_2 / \partial X_2$, implying that

$$MR = MC_1 = MC_2.$$

With a profits tax at the rate t

$$\pi = (1 - t) (R_1 + R_2 - C_1 - C_2)$$

$$= (1 - t) (R - C_1 - C_2).$$

It can be easily seen that the first order conditions do not change at all. What it implies is that in the pre- and post-

tax situations, the price and output produced remain the same, signifying no shifting of the tax.

2.4.2 Price Leadership

Next, we discuss the price leadership model. We discuss two different models of price leadership. The two models are not always mutually exclusive and can be treated as two different approaches to the same basic hypotheses of price leadership. The premise is that for some reason a particular firm is accepted as the price leader by all other firms and they sell their products at the price decided by the leader. Their outputs are profit maximising, under the price constraint.

(i) First, we take up the case of low-cost price leader. A firm becomes the leader by virtue of its low costs and resulting ability to cut prices. For convenience, we again assume a duopoly.

Keeping the notations the same as in 2.4.1, the market demand is given by

$$P = f(X) = f(X_1 + X_2) \quad \dots (2.4)$$

The firms have different costs, defined by the functions

$$C_1 = g_1(X_1) \text{ and } C_2 = g_2(X_2),$$

where $C_1 < C_2$.

Firm 1 is the leader by virtue of his lower costs. He assumes that the rival firm will produce a multiple B of his

own output,¹³ that is

$$X_2 = BX_1 \quad \dots (2.5)$$

Hence, the demand function relevant to the leader's decision is

$$P = f(X_1 + BX_1) = f[X_1(1 + B)]. \quad \dots (2.6)$$

The low-cost leader maximizes his profit by the familiar MC = MR rule, which yields from the first-order conditions for maximization of profits; which is

$$\pi_1 = R_1 - C_1 \quad \dots (2.7)$$

$$\text{where } R_1 = PX_1 = X_1 f[X_1(1 + B)]. \quad \dots (2.8)$$

The second order conditions for maximizing π_1 is

$$d^2\pi_1/dX_1^2 < 0 \quad \text{or,} \quad d^2R_1/dX_1^2 < d^2C_1/dX_1^2 \quad \dots (2.9)$$

The first order condition ($dR_1/dX_1 = dC_1/dX_1$) and the second order condition together give the solution in terms of X_1 . Then (2.5) gives the X_2 and (2.6) gives the price to be charged.

With a corporation tax on profits at the rate t , the profits of the price leader are

$$\pi_1 = (1 - t) (R_1 - C_1) \quad \dots (2.10)$$

This change, as can be seen, does not affect the profit

13 It is clear that there is an implicit assumption of fixed market shares involved here. Otherwise, the price follower can upset the calculations of the price leader by not producing BX_1 amount of output but less, thereby influencing the price. The reason it accepts suboptimal profit is presumably the fact that it is in a vulnerable position and may be wiped out if it does not observe the rules of the game.

maximizing output or price and as B is exogeneous to the system, X_2 also does not change. Thus, there can be no shifting at all under this model.

(ii) We now go on to the dominant firm leadership case. Here, the assumption is that the industry consists of one very large firm acting as the leader and a few smaller firms taking the given price and optimizing the output accordingly. There is no fixed market share as in the previous case, but the leader is assumed to have full knowledge of the market demand curve and the individual supply curves of all the firms.

Since the leader has full knowledge of the supply curves of all other firms, he adds them up to find the composite supply curve

$$X_1 = s(P), \quad \dots (2.11)$$

where X_1 denotes output produced by all other firms. Market demand curve is given by

$$D = d(P). \quad \dots (2.12)$$

With this information it can calculate its own demand curve

$$\begin{aligned} X_2 &= d(P) - s(P) \\ &= f(P) \\ \text{or } P &= g(X_2) \end{aligned} \quad \dots (2.13)$$

His cost curve is given by

$$C_2 = C(X_2), \quad \dots (2.14)$$

and total revenue is given by

$$R_2 = PX_2 = X_2g(X_2) \quad \dots (2.15)$$

The usual first- and second-order conditions for maximizing profits ($\pi_2 = R_2 - C_2$) give the solution in terms of X_2 .

Substituting its value in (2.13), price is determined. The followers take this price and the total output produced by them is given by (2.11) when price is known.

We only need observe that the tax does not make any difference to the first- and second-order conditions to come to the conclusion that output and price remain the same and hence there can be no shifting at all.

2.5 Non-Profit Maximizing Models

Profit maximization as a hypothesis has been traditionally accepted, but there have been doubts expressed about the validity of this hypothesis off and on. The non-profit maximization theories are becoming increasingly insistent that profit maximization need not always be the goal. This is especially true in case of oligopoly and monopoly because under perfect competition earning the normal profits by maximizing profit is a matter of survival, which is not so in other cases. There are many reasons why profit maximization hypotheses may not hold, advanced by various economists. We will only mention a few without explanation here.

- (a) With the divorce of ownership and management, profit maximization may not occur.
- (b) The firms do not have the necessary knowledge or information to maximize profits.
- (c) There can be other goals besides profit maximization like sales maximization, utility maximization, etc. ^{14/}

¹⁴ For details, see Fritz Machlup, "Theories of the Firm: Marginalist, Managerialist, Behavioural," American Economic Review, March 1967, pp. 1-33.

There are many offshoots of these three basic arguments. There are economists who try to rationalize profit maximization in the changed circumstances also. Without going into this debate, we will commit ourselves to a middle position only, that although all the critiques on profit maximization may not be valid, at least some of them are definitely reasonable and logical. Empirical findings are yet to decide the controversy one way or the other, but they do indicate that goals other than profit maximization are possibly there.¹⁵

In this section we discuss some of the theories which give alternatives to profit maximization as objective of the firm and try to bring out shifting implications of such alternatives.

2.6 Scitovsky-Boulding Model

To begin with, Scitovsky had expressed doubts about profit maximization way back in 1943.¹⁶ Boulding applied this line of reasoning to find out possibilities of tax shifting the very next year.¹⁷ The model is discussed briefly below.

Scitovsky had pointed out in his paper that the entrepreneur is likely to have an indifference curve between output

15 For example, see Robert F. Lansilotti, "Pricing Objectives in Large Companies," American Economic Review, December 1958, pp. 921-941.

16 Tibor de Scitovsky, "A Note on Profit Maximization and Its Implications," Review of Economic Studies, 1943-44, pp. 57-60.

17 Kenneth E. Boulding, "The Incidence of a Profits Tax," American Economic Review, September 1944, pp. 567-572.

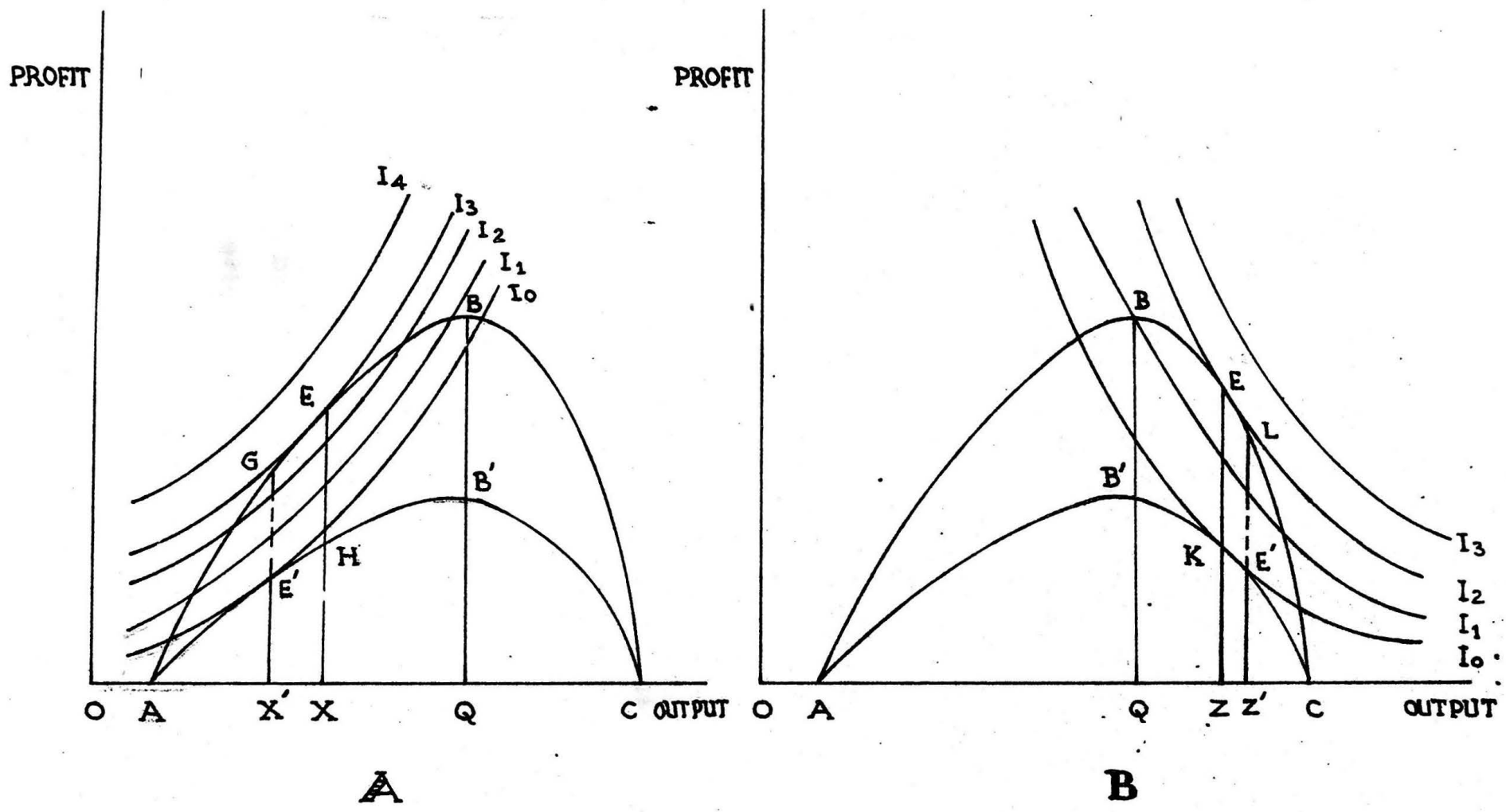


FIGURE - 1 SCITOVSKY - BOULDING MODEL

(indicating entrepreneurial activity) and profit (indicating income). The slope of the indifference curves shows the psychology of the entrepreneur. A positive slope shows the cautious attitude of the entrepreneur, because it implies further effort on the part of the entrepreneur only when larger profits are to be had. A negative slope indicates a cavalier and adventurous attitude as the entrepreneur is willing to take up further work even for a smaller profit. These two cases are depicted in Figure 1 (panels A and B respectively).

The profits curve ABC is identical in both panels. The maximum profits are at B in both cases. However, with the introduction of the entrepreneur's indifference map, the optimum is reached at E, the point of tangency between the entrepreneur's indifference curve and the profits curve. The output produced is either OX (panel A) or OZ (Panel B). It is not OB, the profit maximizing output, in either case. The profit, in both cases, is lower than the maximum obtainable.

With the imposition of a profits tax the profit curve for the entrepreneur becomes AB'C. Since this is the net profit curve on which the entrepreneur is likely to base his decisions, the relevant tangency point is now E'. However, in one case output falls from OX to OX' (panel A) and in the other case, it goes up from OZ to OZ' (panel B). Thus, the first situation would raise prices (assuming all the firms in the industry react similarly to the tax) and the second will lower it.

Boulding discounts the second situation as rare due to

the unlikely type of indifference map¹⁸ and considers the first situation as more realistic. Since the imposition of the tax results in higher prices, he concludes that the tax is undesirable and is shifted.

As far as the question of desirability is concerned, Boulding's conclusion that the tax is undesirable cannot be faulted, if only because it reduces production. But his conclusion about shifting does not seem to be valid if we consider the case carefully.

Shifting, it should be kept in mind, is not defined in terms of rise in price or fall in wage rates; it is defined in terms of profit (or income). In the case of corporate income tax we can define four degrees of shifting:

- (i) Zero Shifting: This occurs when the pre-tax net (=gross) profits fall by the full amount of the tax, implying that post-tax gross profits are equal to the pre-tax profits (gross = net).
- (ii) Partial Shifting: Partial shifting occurs when post-tax gross profits are higher than the pre-tax profits but post-tax net profits are less than the pre-tax profits;
- (iii) Full Shifting: This occurs when post-tax gross profits go up in such a way that post-tax net profits are equal to pre-tax profits;

¹⁸ As we shall see later in this chapter, Baumol argues more or less in favour of the behavioural assumption that Boulding rejects.

(iv) **Overfull Shifting:** This is when both post-tax gross and net profits are higher than the pre-tax level. All these definitions are of course subject to the ceteris paribus condition.

Boulding's more probable case (panel A), it can be seen, does not fall into any of these categories. Therefore, it cannot be called shifting at all. What it actually shows is tax avoidance, rather than tax shifting.

In the pre-tax case, EH portion of the profits would have been taxed away if there was no change in the equilibrium. In the post-tax situation, the actual portion of the profits taxed away is GE'. This means that the entrepreneur is avoiding (EH-GE') amount of tax, although in the process his own income (net profits) comes down from HX to E'X. This is because the tax disturbs his 'price' ratio between profits and leisure or inactivity. Leisure becomes cheaper compared to profits and so it is substituted for profits.

2.7 Average-Cost Pricing

There is no single economist to whom one can credit the model being discussed next - that of the average-cost pricing. It probably originated with a well-known paper by Hall and Hitch.¹⁹ Later, others have continuously amended, added to, and refined it. However, what is discussed below is only a 'representative' average-cost pricing model.²⁰

¹⁹ R. Hall and C. Hitch, "Price Theory and Business Behaviour," Oxford Economic Papers, May 1939, pp. 12-45.

²⁰ See A. Koutsoyiannis, Modern Microeconomics, Macmillan, London, 1975, pp. 270-281, for details of the model sketched here. The shifting possibilities are of course not brought out by her.

The basic characteristic of this theory is the postulate that price is set according to the average cost principle

$$P = AVC + GPM = AC$$

where AVC = average variable cost, and

GPM = Gross profit margin.

This means that price is set as the average cost plus a profit margin which can be a certain 'target rate of return' or a 'markup'.

The striking feature is that the demand side is completely jettisoned in price-fixing. The two arguments used against the usual short-run profit maximization principle are that short-run profit maximization does not always lead to long-term profit maximization due to intertemporal chain of effects of decisions made in one period and due to unsurmountable uncertainties about demand. However, as we will see later, demand does come into picture in an indirect way even though it is not acknowledged explicitly.

The long run costs are also uncertain due to the rapid technological change and change in factor prices for different unforeseen reasons. Hence, it is asserted that the firm bases its decisions on the short-run average costs.

It is explicitly or implicitly assumed that the short-run average variable cost curve has a flat stretch resulting in a saucer-shaped curve as shown in Figure 2.²¹ This is due

²¹ For a detailed discussion on the shape of these cost curves, see Koutsoyiannis, *ibid.*, pp. 115-119.

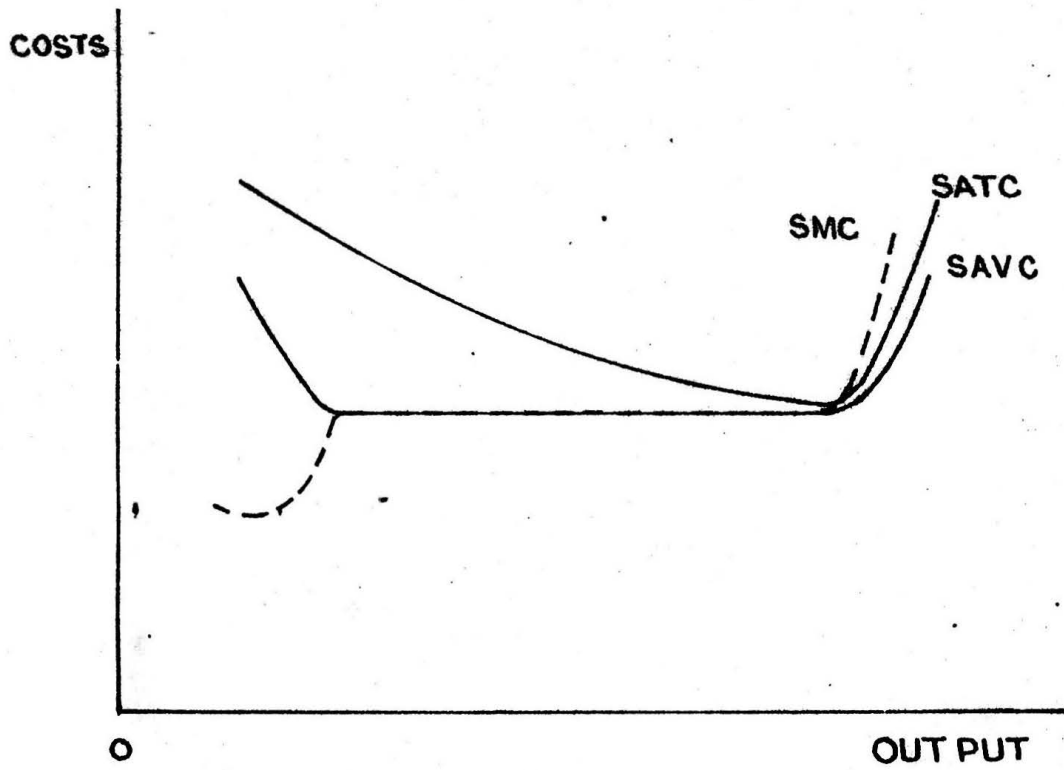


FIGURE - 2

SHORT-RUN COST CURVES

to the fact that the firms generally build into their plants some reserve capacity for various reasons, viz. to meet some seasonal fluctuation in demand, to maintain smooth flow of production irrespective of minor breakdowns, to allow some flexibility in changing the product suitably to cater to the changed tastes, and so on.

SATC, SAVC and SMC curves in Figure 2 show average total costs, average variable costs and marginal costs respectively, all in the short-run. The falling part of SAVC is attributable to indivisibilities and increasing productivity of variable factors. The flat stretch shows the built-in reserve capacity and the rising part is when the production exceeds even the reserve capacity resulting in frequent breakdowns in machinery, smaller productivity of variable factors, etc. Given the continuously falling AFC, the SATC is easily derived. The SMC has a shape corresponding to the SAVC and it coincides with AVC over the flat stretch.

The pricing decisions are based on the flat stretch of SAVC, because the firms expect to produce within that range only. Even when they are producing on the falling or rising part of the SAVC they do not charge prices accordingly because they want to keep their prices as steady as possible to earn goodwill and also because they believe that they will come back to the flat portion of SAVC eventually.

The firms usually have a desired price that they would like to charge, based on the costs and a stipulated (subjectively

determined) profit rate. The mark-up rule is

$$P = AVC + GPM$$

The AVC is assumed to be known with certainty. The basic purpose of the firm is to maximise profits in the long-run, and it hopes to achieve this by sticking to the pricing rule given above because it believes that SAVC will approximate the long-run one fairly well.

The gross profit margin (GPM) is determined as:

$$GPM = AFC + NPM,$$

where AFC is average fixed costs and NPM is net profit margin. NPM is subjectively determined and AFC is determined as

$$AFC = TFC/X^*,$$

where TFC is total fixed costs and X^* is a 'planned', or 'budgeted', or 'normal' level of output. This is within the flat stretch of SAVC and the firm expects to produce roughly this amount of output. It is not clearly spelt out how NPM is exactly determined except a few vague references to 'matter of experience', but probably it is determined by the opportunity cost of capital plus whatever monopoly profits the firms think they can get away with. This, of course, is exogenous to the system.

Thus the 'normal' price based on the costs is arrived at and while deciding the actual price to be charged, certain other factors, like business conditions (boom or depression),²²

22 This is where demand is eased back into the picture through the back-door though there is a claim made about discarding demand factor altogether.

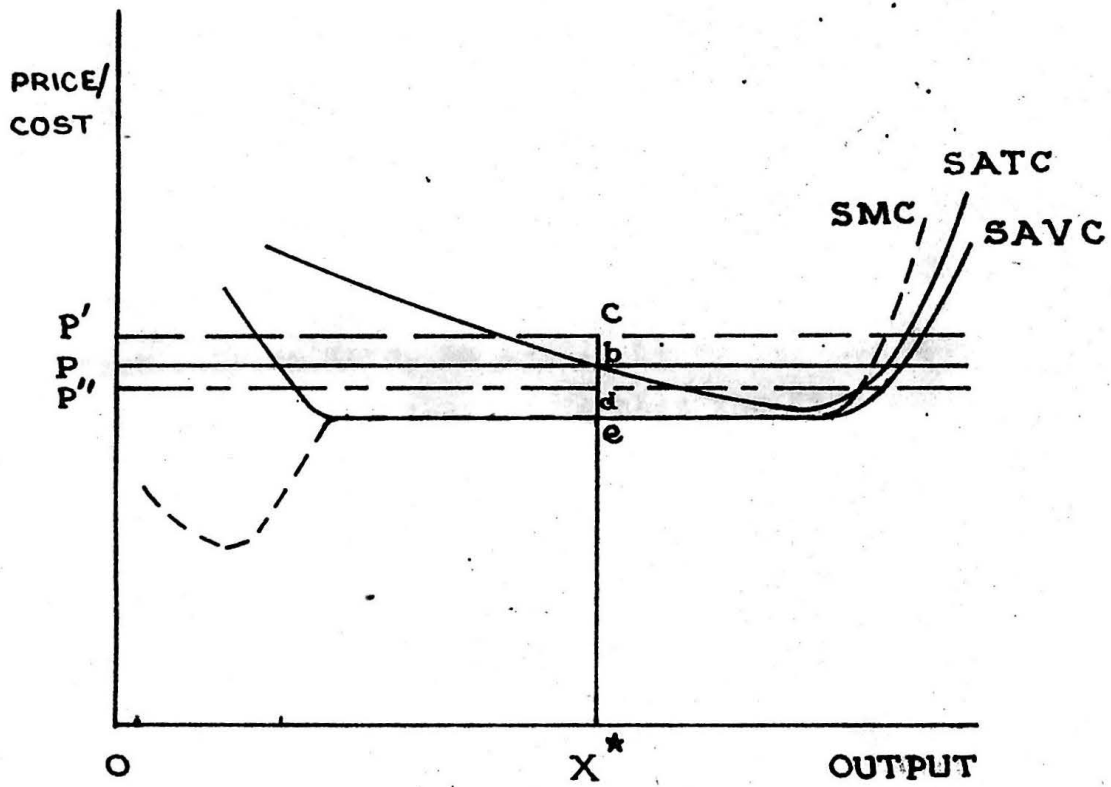


FIGURE -3 AVERAGE - COST PRICING

potential competition or the effectiveness of barriers to entry, etc., are also taken into account. With reference to Figure 3, SATC includes GPM. X^* shows the 'budgeted' output and P shows the 'normal' price. But if business conditions are booming and barriers to entry are high, the firm may decide to charge OP' which is higher than OP . In the converse case, price charged may be OP'' , below OP . Its normal gross profit margin is given by ab which may go up to ac or come down to ad . There is no guarantee that the firm will sell OX^* amount of output only (no more, no less), given such ad hoc adjustments in price. The implication is that the firm sells as much as it can.

It is not very difficult to draw shifting implications from this sort of a model. It is certain that a profits tax will raise the GPM and hence will push the SATC up. As a result, the 'normal' price, P , will go up. This shows the tendency to shift, however, rather than actual shifting, because P is not the price. The actual shifting will depend on the actual price charged. If it is nearer to P'' , the price may be raised without fear of lowering the barrier as any firm will have to face the tax.²³ If it is nearer to P' , then an attempt to shift the tax in higher prices may result in fall in sales to such an extent that the firm may be forced to operate at a suboptimal capacity on the falling part of SAVC. Here again

²³ The case of entry by a non-corporate firm is discussed in Section 2.12 later.

demand plays an important role. Thus, shifting will depend on whether the price charged is near the highest possible (no shifting) or near the lowest acceptable (probable shifting).

2.8 Bain's Limit-Pricing Models

Bain criticised the traditional oligopoly theories for assuming a fixed number of firms and not considering entry. Naturally, his model focuses on the problem of entry of new firms²⁴ that the existing firms have to face. In his two major works, he tried to show why price might be lower than the profit maximizing one in the first one, and in the second, he tried to show why it would be higher than competitive price. He assumes that entry of new firms is considered undesirable by existing firms, although no clear rationale is provided for this assumption. One can hazard a guess that probably the existing firms believe that by keeping themselves insulated from new competition, their long run interests are safeguarded even if it entails some sacrifice of current profit. To keep potential entrants out, oligopolists use four types of barriers to entry: (a) product differentiation barrier, (b) absolute cost advantage of existing firms, (c) economies of scale, and (d) large initial capital outlay. By making use of these barriers, the oligopolists make entry unattractive in terms of profit to potential entrants.

24 See (i) J.S. Bain, "A Note on Pricing in Monopoly and Oligopoly," American Economic Review, March 1949, pp. 448-464, and (ii) J.S. Bain, Barriers to New Competition, Harvard University Press, Cambridge, Massachusetts, 1956.

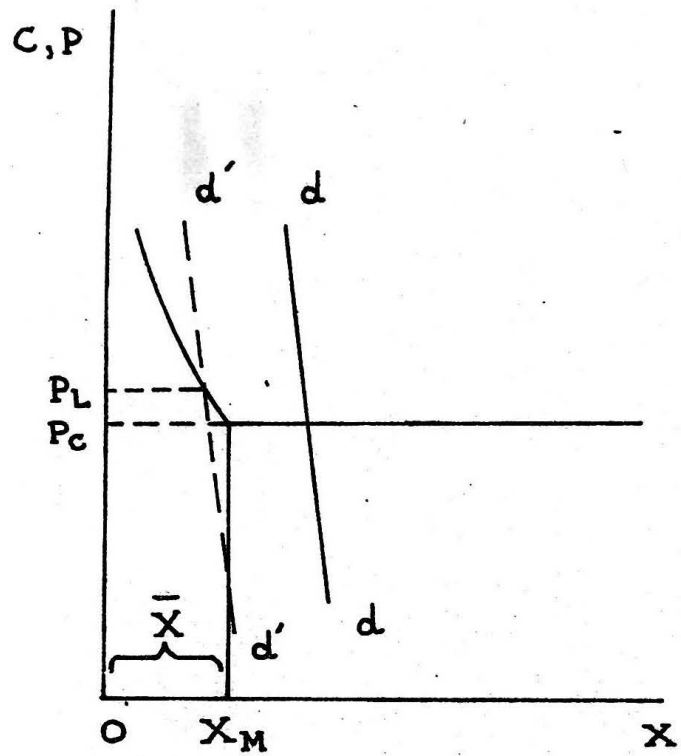
In pricing, the existing firms have three alternatives open before them: (i) to charge the limit price P_L (below the profit maximizing price P_M), (ii) to charge P_M and prevent entry (this is when P_L is above P_M), and (iii) to charge P_M (even if $P_M > P_L$) and risk entry, discounting future profits for the risk involved. The third alternative, however, may not be all that risky if there is a collusive agreement with the new entrant(s) and its(their) share(s) is(are) definitely known. The necessary information to calculate the limit price preventing entry upto that level is assumed available to the existing firms.

Under these conditions, the profits of a firm at the limit price P_L is, let us say, π_L . A new entrant, however, cannot earn any profit due to effective barriers of entry. With the introduction of the tax at the rate t , the profits at the limit price come down to $\pi_L(1 - t)$. However, the limit price P_L is derived in such a manner that it gives π_L profit to the firm under consideration but yields no profit to a new entrant. Other things being constant, immediately price is raised beyond P_L , entry occurs because there is an opportunity of earning some profits. And, as long as t is below 100 per cent, some positive gross profits will yield some positive net profit. Thus, whether there is a tax or not, P_L is the limit price. It follows that if P_L was being charged in the pre-tax situation, there can be no shifting. If P_M was being charged because it was lower than P_L , then also there will be no

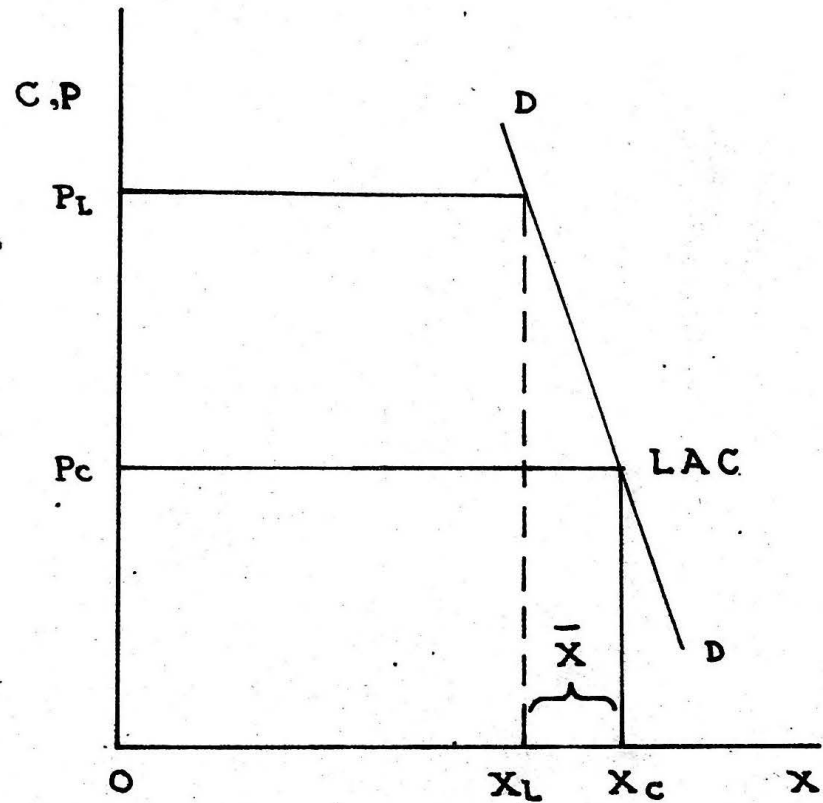
shifting because the same P_M will maximize after-tax profits also.

In his later model, Bain tries to show how it is possible to prevent entry even if cost curves are the same for all firms. How exactly it is done depends on whether the existing firms are believed to keep price constant or to keep output constant even after entry by the potential entrants. In the price constant case, the price is kept at such a level that the new entrant will have to enter the industry at a sub-optimal level. In the output constant case, such an amount is produced which makes it unprofitable for the new entrant to come in with the minimum optimal output. It is obvious that economies of scale are very important here. The limit pricing works on the basis of the assumption that possible entrants know the score well and they will not want to come in knowing that they cannot earn any profit. Actually, entry will make production unprofitable for everybody. The following diagram (Figure 4) explains the mechanism outlined above.

We have stated some of the assumptions earlier. The shape of LAC is also assumed given (with a minimum optimal scale, \bar{X}), being the same for all firms due to equal access to the same technology. Competitive price is given by $P_c = LAC$, in the flat part of LAC. All products are similar and sold at the same price in the market. Market demand curve is known to all existing firms as well as potential entrants. All firms producing \bar{X} have equal market shares. Under these



A



B

FIGURE - 4 LIMIT - PRICING

assumptions, in Figure 4, panel A shows the price-constant case and panel B the output-constant one.

Panel A, in Figure 4, shows a firm's LAC and demand curve. The pre-entry demand curve is dd . However, given the market demand curve and equality of market shares, the existing firms can calculate market shares (for all), post-entry, at various prices. They will choose the highest of those prices at which entry would result with suboptimal scale of output for every firm and no profits at all. In the diagram, such a price is shown by P_L which allows the existing firms to produce an output greater than \bar{X} each. But if entry occurs, the individual demand curves become $d'd'$ and at the same price (P_L), each firm can produce an output less than \bar{X} only. The new entrant, as well as existing firms, do not earn any profit. Thus, entry is not profitable.

Panel B in Figure 4 shows the industry situation, not the firm. DD is the demand curve. When the existing firms know that the potential entrant expects them to keep their output constant post-entry, they produce such an amount together, which, if entry occurs with the minimum optimal output \bar{X} , will not yield any profits post-entry. In the diagram X_C is the total output in the industry which does not yield any profit. The firms produce $X_C - \bar{X} = X_L$ amount of output together which results in price P_L . The individual firms' output can be easily found out at X_L/K , where K is the number of existing firms.

In these two cases, the price is kept at such a level that entry at that price gives zero profit to the entrant and any price above it will give some profit to the entrant. Hence, if a profits tax is levied and there is an attempt to shift the tax in higher prices, the entrant gets the opportunity to come in. Because, any price higher than P_L gives some before-tax profits to the new entrant, and, as long as tax rate is below 100 per cent, that will give it some after-tax profits too. Hence, shifting will immediately result in entry of a new firm which the existing firms are assumed to avoid. Thus, there can be no shifting in this model.

Modigliani's²⁵ model is an extension of the output-constant case of Bain. The other persons to extend this model of Bain are Sylos-Labini (preceding Modigliani), Bhagwati, and Pashigian. Since their models are basically not different and our basic shifting implication remains therefore valid for these extensions also, they are not discussed at length here. It will suffice to point out the fact that like in Bain's model, any attempt at shifting will result in entry, which is supposed to be the all-important consideration for existing firms.

A paper by Bruno²⁶ merits mention here. He presented a mathematical version of the Modigliani model and drew the

25 Franco Modigliani, "New Developments on the Oligopoly Front," Journal of Political Economy, February 1958, pp.215-232.

26 Sergio Bruno, "Corporation Income Tax, Oligopolistic Markets and Immediate Tax Shifting: A Suggested Theoretical Approach," Public Finance, No. 3, 1970, pp. 363-378.

shifting implications from it. It shows two major conclusions: (i) that shifting is quite probable, and (ii) degree of shifting will vary inversely with size. Apparently, it is at variance with our result. Actually, it is not so, because the shifting conclusion in Bruno's discussion arises from the fact that, following Modigliani, he has treated average costs as including the opportunity cost of capital or a normal profit. We have not done so, and if we incorporate that into our analysis of Bain's model, it is obvious that the tax rate will push up the LAC, allowing at least partial shifting. The second conclusion follows from relaxing our assumption of equal market shares for all firms. This is because the absolute amount of shifting is the same for all firms irrespective of size and hence, smaller firms can shift the tax to a comparatively greater degree.²⁷

2.9 Baumol's Sales Maximization Hypothesis²⁸

Baumol's model explicitly or implicitly makes three major assumptions: (a) oligopolistic interdependence among the firms within the industry is sufficiently small to be ignored; (b) the firms try to maximize sales revenue rather than profit; and (c) this maximization is limited by a minimum profit constraint. The model and its tax shifting implications can be derived easily with the help of Figure 5.

²⁷ For proof, see ibid.

²⁸ This has been dealt with in Michael E. Levy, "Professor Baumol's Oligopolistic Model and the Corporation Income Tax," Public Finance, No. 3-4, 1961, pp. 366-372.

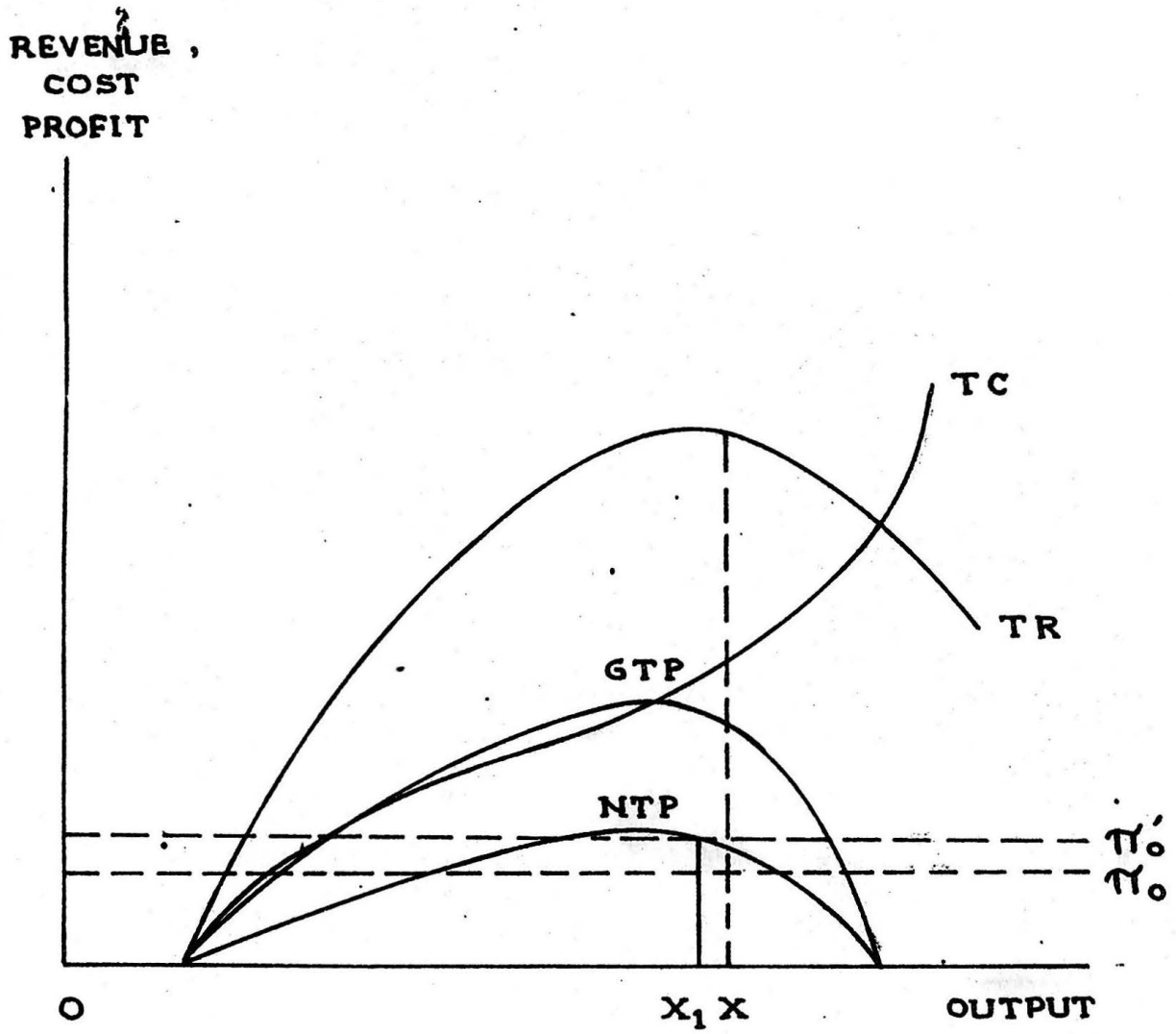


FIGURE - 5 BAUMOL'S SALES MAXIMISATION HYPOTHESIS

In Figure 5, TC and TR curves show the total costs and total revenues, respectively. The GTP curve shows the gross total profits and NTP curve is the corresponding net total profits curve with a 50 per cent tax. Before the imposition of the tax NTP would not exist.

π_0 and π'_0 are two hypothetical 'minimum required profit' values, as postulated by Baumol. This value acts as a constraint on sales maximization. Two levels are taken here to show the difference in the degree of shifting depending on the exact magnitude of such a constraint.

Taking π_0 first, it is clear that pre-tax output will be OX, because this output maximizes sales²⁹ and yields profits much higher than the required profit. Even after the tax, net profits at the same output are higher than that necessary. Therefore, there is no attempt at reducing production. Consequently, price also remains the same and as a result, profits (net of tax) fall by the full amount of the tax denoting zero shifting.

If π'_0 is the minimum profits constraint, the same OX output meets the constraint in the pre-tax situation. After the tax is imposed, however, the profits to the producer (net) do not meet the constraint. Hence, the firm is forced to cut production and raise prices until it at least meets the constraint. This results in a production OX₁ amount of output. This shows partial shifting, because gross profits rise, but

not enough to prevent a fall in net profits.

Full shifting would occur if the firm was earning only the minimum necessary profits to begin with. The foregoing analysis indicates that degree of shifting in this model will depend upon the profit-slack, or the amount of profits being earned minus the minimum necessary profits, which has an inverse relation with the degree of shifting. When this slack is zero, the tax results in full shifting; when the slack is equal to or greater than the profits taxed away, the tax does not induce any shifting at all.

Levy, and Musgrave and Musgrave³⁰ drew wrong conclusions from Baumol's model with regard to this tax. At any rate, neither of them realized that the model allows full spectrum of the various degrees of shifting. Levy, despite doing his analysis on the right lines, made the mistake of considering only one level of minimum profits constraint and ended up with the conclusion that this model always gives rise to partial shifting. Musgrave and Musgrave mistakenly equated sales with the physical output and hence concluded that there will always be full shifting. This is because output can be expanded infinitely until the profits are equal to the minimum necessary and so at any time the firm will be earning the minimum necessary profits only. And as we showed, when slack is zero,

³⁰ R.A. Musgrave, and Peggy B. Musgrave, Public Finance in Theory and Practice (2nd Edn.), McGraw-Hill Kogakusha, Tokyo, 1976, pp. 422-423.

the tax will result in full shifting. This has, however, been corrected in the third edition of the book.³¹

2.10 Managers' Utility-Maximising Behaviour

In section 2.5 of the present chapter, alternatives to profit maximisation hypothesis were briefly mentioned and it was also said that the divorce of management and ownership dampens the profit maximization motive. Some economists have framed models which recognize the role of profits, but also give equal importance to the objective of the managers, in whose hands decision-making in business rests. There are quite a few contributions in this limited field, but we will outline a 'representative' model without going into the individual ones.³² The application of such models in corporation tax shifting analysis is by now quite usual,³³ and so the following analysis only tries to catch the essential features of such models briefly.

31 See R.A. Musgrave and Peggy B. Musgrave, Public Finance in Theory and Practice (3rd Edn.), McGraw-Hill Kogakusha, Tokyo, 1980, pp. 430-431.

32 There is a very good review of earlier contributions in Oliver E. Williamson, The Economics of Discretionary Behaviour: Managerial Objectives in a Theory of the Firm, Prentice-Hall, New Jersey, 1964, besides his own model.

33 See, for example, Frederick D. Sebold, "Short-Run Tax Response in a Utility Maximisation Framework," National Tax Journal, December 1970, pp. 365-372; Jon Cauley and Todd Sandler, "The Short-Run Shifting of the Corporation Income Tax: A Theoretical Investigation," Public Finance, No. 1, 1974, pp. 19-35; and Tapas Kumar Sen, "Empirical Testing of Tax Implications in Williamson Model: A Suggested Approach," Public Finance, No. 3, 1979, pp. 384-394.

Profit is considered 'necessary' upto a certain level only, that which will keep the stockholders satisfied and provide for some growth of the firm. Denoting this level by π_0 we can call the rest of the profits actually earned as discretionary profits. Symbolically, it will be

$$\pi_D = \pi_A - \pi_0$$

where π_D stands for discretionary profits, π_A for actual profits, and π_0 for minimum necessary profits.

π_D is one of the arguments in the utility function of the decision-making unit or the managers. There can be many other arguments as narrated by Williamson and others, but for simplicity, we confine ourselves to the discussion of only one more argument, output. The utility function, then, is

$$U = U(\pi_D, X),$$

X standing for output. It is this utility function that the managers will try to maximise. With a tax at the rate t ,

$$\pi_D = (1 - t) \pi_A - \pi_0.$$

The maximisation of the utility function can be easily shown in a diagram (Figure 6).

In Figure 6, I_1 and I_2 show the indifference curves for the managers with respect to the utility function. PLP' is the pre-tax profits curve, which shows the possible combinations of output and profit. The dashed lower extension of the diagram is relevant only when even π_0 cannot be earned. The indifference curves are for π_D and output only. The dashed lines below OX line signify this and the fact that the whole π_A is not relevant to the indifference curves.

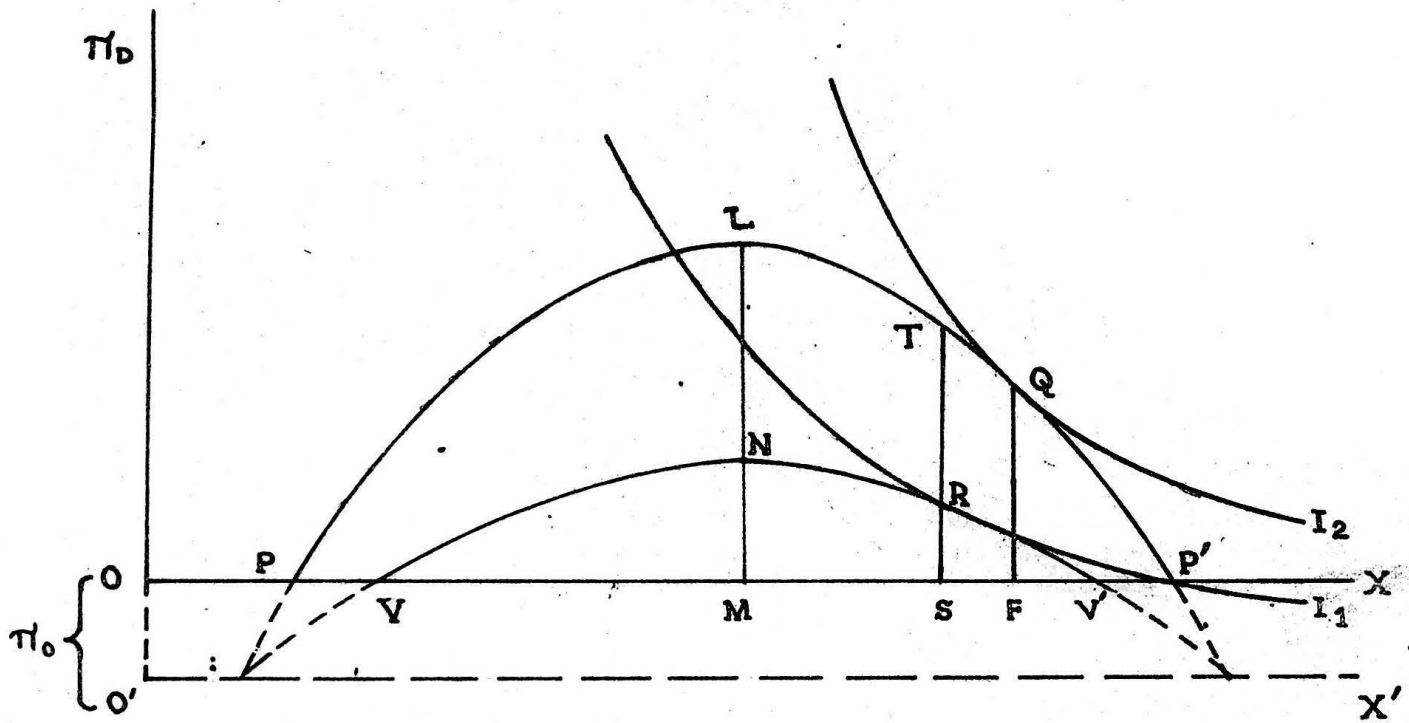


FIGURE - 6 MANAGERS' UTILITY - MAXIMISATION MODEL

In the pre-tax situation, equilibrium occurs at the tangency point of an indifference curve and PLP' , which is at Q . π_D equals QF and output equals OF . With the imposition of a tax ($t = .5$), VNV' shows the net profits curve which will be the relevant curve for decision-making now. The new equilibrium obtains at R with $\pi_D = RS$ and Output = OS . Thus, output has fallen by SF , gross profits have increased by $(TS - QF)$ and net profits have fallen by $(QF - RS)$. Therefore, it is a clear case of partial shifting.

However, depending upon the shape and position of the relevant curves any degree of shifting can be shown as possible, including increase in output and reduction in gross profits (i.e. the case of tax avoidance).

The similarity between the model outlined above and that of Scitovsky-Boulding shown in panel B of Figure 2.1 (section 2.6 of the current chapter) is striking. However, this model is more general in that the utility function can contain more than two arguments as well. We have taken only two arguments for the sake of simplicity, but it is by no means necessary to be confined within only two arguments. In fact, Cauley and Sandler have discussed a similar model with three variables, output, slack (defined as payment to the decision-making unit over and above what is necessary to keep them working) and profit. Hence, this is a more general model than the Scitovsky-Boulding one.

2.11 Signal Theory

This theory was first offered by Krsyzaniak and Musgrave³⁴ as a rationalisation of their finding that the corporations shift the corporation income tax burden more than fully. They had offered it as an off-the-cuff hypothesis, but later Reaume³⁵ took it up and demonstrated that even if the firms are profit-maximizing oligopolists, maximizing their profits subject to the reaction functions, there can be shifting of the tax provided there is unexploited industry profit and that the tax rate enters the reaction functions. In other words, the firms should believe that a rise in the tax rate acts as a signal for all firms in the industry to contract output, raise prices and thereby increase their own gross profits and move closer to the industry profit maximizing position jointly.

To recapitulate Reaume's analysis briefly, let us again assume a duopoly. Assuming a particular price function,

$$P_1 = B_0 + B_1Q_2 - B_2Q_1 - B_3Q_2, \quad \dots (2.16)$$

where P_1 is the price of firm 1's product, Q_1 and Q_2 are outputs produced by firm 1 and 2 respectively, and $B_0 \dots B_3$ are positive constants.

³⁴ Marian Krsyzaniak, and Richard A. Musgrave, The Shifting of the Corporation Income Tax, Johns Hopkins Press, Baltimore, 1963, p. 47.

³⁵ David M. Reaume, "Short-Run Corporate Tax Shifting by Profit-Maximizing Oligopolists," Public Finance Quarterly, January 1976, pp. 33-44.

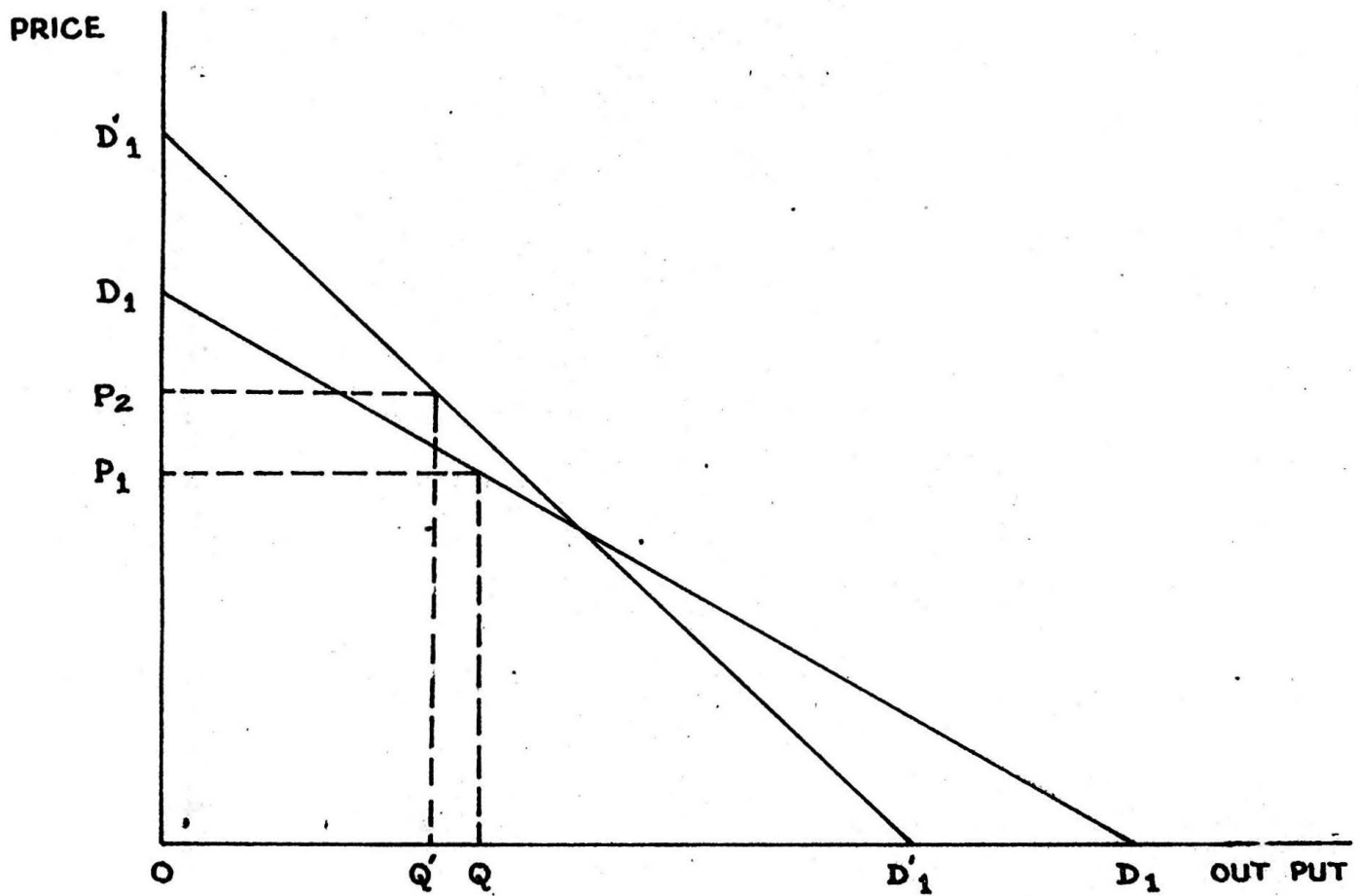


FIGURE -7 SHIFTING UNDER SIGNAL THEORY

Equation (2.16) can be written in a different way to show the slope and intercept of the demand curve for firm 1 clearly under the ceteris paribus assumption, taking Q_2 as given:

$$P_1 = (B_0 - B_3Q_2) + (B_1Q_2 - B_2)Q_1 \quad \dots (2.17)$$

If the demand curves are to be of the usual type, the intercept must be positive and the slope negative. Hence, we have,

$$(B_0 - B_3Q_2) > 0 \text{ and } (B_1Q_2 - B_2) < 0.$$

When the tax rate is raised, it acts as a signal to cut production and raise prices. The expected cutback in Q_2 raises the intercept, i.e. $(B_0 - B_3Q_2)$, for firm 1's demand curve and lowers the slope, i.e. $(B_1Q_2 - B_2)$.

Figure 7 shows the shift in the demand curve under the assumption that the tax lowers output for all. D_1D_1 is the demand curve in the initial period for firm 1. When the tax rate goes up, Q_2 is expected to fall and so the demand curve shifts to $D_1'D_1'$. Since similar shift will occur in the case of demand curve for firm 2 also, if the initial equilibrium was at Z, the new equilibrium must be at a point above and to the left of it, say, Z'. This change in the equilibrium signifies shifting as can be easily seen.

The same result holds without a specific price function like (2.16) as long as the price is a function of outputs of both firms and the outputs themselves are functions of each other's output and the tax rate, as shown by Reaume. The

general idea seems to be that if the firms, taken together, are not maximizing industry profits and if the tax acts as a signal for them to reduce output and raise prices, it pushes them towards the industry profit-maximizing situation, thereby causing shifting of the tax.

2.12 General Observations

After discussing short-run effect of the imposition (or rise in the rate) of the tax under different market situations and under different behavioural hypotheses, we can make only a negative observation: that it is impossible to reach a conclusion about the degree of shifting from theoretical analysis alone.

There are a few points to be noted here. First, it can be observed that whenever there is profit maximization, at firm-level and industry-level, the possibility of shifting is dim. This is because by definition there is no way profits can be increased, since it is already the maximum obtainable. But this is only when there is no tax on the normal profits included in the cost. The corporation income tax, however, does not have any standard exemption limit and, as such, part of costs are taxed. This is bound to push up cost curves, which will cause at least partial shifting even in the cases where we have concluded there will not be any shifting.

Second, throughout the foregoing analysis we have treated corporation income tax as a more or less general profits tax, applicable to any existing firm or potential

entrant. How far this holds true is a debatable matter. There are other forms of business which do not pay corporation income tax, though they have to pay income tax. Thus, if one had data about the finances of the non-corporate sector, the differential tax rate could be found out. However, if one took a non-corporate firm comparable in size to an average company, it will normally have at least Rs. 1 lakh profit, to which application of ordinary income tax rates and surcharges would be at the rate of 40 per cent to 50 per cent. Thus, the differential tax, if any, is likely to be small and thus, the idea of a firm being in a better competitive position because it does not have to pay corporation income tax is, to a large extent, fallacious. Moreover, the nature of modern manufacturing is such that production must be carried on at a certain minimum scale for the product to be competitive, and the idea of non-corporate firms in such industries competing with corporate ones is really only academic because of the huge investments required. The tax advantage, if any, for the non-corporate firms pales into insignificance against other advantages of incorporation. In manufacturing, it is beyond doubt so. But it may not be so for other sectors, particularly agriculture. However, even in agriculture, plantation crops would again require large investments, too large for non-corporate firms.

Hence, although theoretically it may be argued that any attempt to shift the tax will result in the loss of market

share for the companies because their non-corporate counterparts need not raise their prices, it is very unlikely that this argument will be actually important. In any industry where corporate form of business is prevalent, non-corporate sector either does not exist for all practical purposes, or it plays only a subsidiary role.

Third, in our theoretical analysis of short-run shifting, we have assumed throughout that the whole of profits is taxable. Actually, it is not so because of the choice in the method of raising capital. Capital in all companies consists of debt as well as equity. The part of profits going to interest payments for the debt is treated as costs by the tax authority and not taxed by corporate income tax. Only the part going to the shareholders—immediately in the form of dividends or later, in the form of higher share price due to the retained earnings—are taxed. The effect of this particular factor is not immediately clear; but it stands to reason that this would dilute any tax-induced behaviour. But as far as shifting in terms of only profits going to shareholders—called profits before tax—is concerned, it is difficult to say anything until the issue of tax effect on the capital structure is resolved. Assuming no effect on the capital structure, the various conclusions reached in the sections 2.2 through 2.11 remain generally valid so far as the direction of tax-induced change is concerned.

2.13 Backward Shifting

So far we have talked about forward shifting only to the total disregard for backward shifting. In fact, except one attempt by Musgrave,³⁶ there is no theoretical study on possible backward shifting of the tax. The reason may be the belief that whether profits are maximized or not, wages are certainly minimized and that leaves no scope for further reduction as a result of the tax. However, generally speaking, if the wages or any part of it is tied to the after tax profits in any way, increase in tax rate will entail partial backward shifting at least. Another general observation is that whenever there is an attempt to shift the tax forward by reducing output, this may allow the firm to lay off some workers and thereby shift the tax backwards also to some extent. Outside of these general observations, no specific conclusion can be ventured about backward shifting.

36 Musgrave, Public Finance, op.cit., pp. 282-283.

CHAPTER 3

EMPIRICAL ANALYSIS OF THE SHIFTING AND INCIDENCE OF CORPORATE INCOME TAX

Because of the inconclusive nature of the theoretical analysis of shifting and incidence of corporate income tax, the next logical step is to approach the subject empirically. Since theory showed that the net result depended upon a few parameters which take values impossible to predict on a priori reasoning, it is natural to turn our attention to empirical work on the subject. However, the empirical analyses have varied in their conceptualization, approach and results quite widely. The tools of such analyses have been sharpened considerably over the last two decades and the various approaches have been generalized to a great extent, but a consensus of opinion is still elusive. So far, empirical analyses have proved to be as inconclusive as theoretical analyses.

However, each one of the studies adds to our knowledge and perception of the problem at hand, and it is useful to examine the existing literature, so that an insight into the problem and the complexities involved can be gained.

The empirical studies are divided into two groups: the first, dealing with countries other than India and the second, dealing with India.

3.1 Empirical Studies on Countries Other Than India

Before we take up individual studies or groups of them, it will be convenient to broadly classify them into the following four groups: (i) simple statistical studies; (ii) econometric studies; (iii) general equilibrium studies; and (iv) others. The first three are more or less in chronological order in terms of the most widely known studies.

3.1.1 Simple Statistical Studies

The first empirical analysis to investigate shifting of company tax was undertaken way back in 1927 by Coates in a memorandum submitted to the Colwyn Committee.¹ He used basic statistical concepts like mean, median, correlation, etc., to examine whether the tax causes the profits to go up to any extent, which would signify shifting. He examined annual, quarterly, and in some cases monthly data to reach the tentative conclusion that his analysis does not support the full-shifting analysis. His tools being extremely crude, not much reliance can be put on his conclusions and he himself admitted that his results were merely suggestive. But it goes to his credit that he saw the problem in its entirety: "From the field of complexity offered by these figures, it is perhaps difficult to draw any conclusions beyond the conviction that they must be the result of numerous forces acting in various directions."² If

¹ W.H. Coates, "The Incidence of Income Tax," Appendix XI, Appendices to the Report of the Committee on National Debt and Taxation, H.M.S.O., London, 1927, pp. 65-114.

² Ibid., p. 96.

this was fully understood and kept in mind by later economists trying to unravel the mystery of corporate tax shifting, probably a lot of confusion could be avoided.

A Brookings Institution study carried out by Kimmel³ adopted the direct approach, asking the businessmen, through questionnaires, how they deal with the tax. The results showed that the businessmen generally consider the tax as a cost and consequently, shift it forward to a considerable extent. Besides, the tax was found to have significant effects on capital structure as well. But these results cannot be taken very seriously as proof of shifting despite theoretical rationalizations by Kimmel for the simple reason that what businessmen believe need not necessarily be correct. What the study shows is probably willingness to shift; ability to do so is another matter altogether. In fact, businessmen in United States as well as United Kingdom have always been insisting that they shift the tax; but opinions cannot substitute rigorous evidence.

Morris Beck tried to examine the other side of the coin, the ability to shift.⁴ He tried to follow up Shoup's suggestion that ability to shift depends upon capital structure and turnover rate⁵ with an empirical analysis and found the latter to be

³ Lewis H. Kimmel, Taxes and Economic Incentives, Brookings Institution, Washington D.C., 1950.

⁴ Morris Beck, "Ability to Shift the Corporation Income Tax: Seven Industrial Groups," National Tax Journal, Vol. 3, September 1950, pp. 248-256.

⁵ Carl S. Shoup, "Incidence of the Corporation Income Tax: Capital Structure and Turnover Rates," National Tax Journal, Vol. 1, March 1948, pp. 12-17; Reprinted in Musgrave and Shoup (ed.), Readings in Economics of Taxation, George Allen and Unwin, London, 1959, pp. 322-329.

of paramount importance. But he did not conclude anything about actual degrees of shifting; he only ranked the seven industrial groups considered according to the ease in shifting the tax. The ease in shifting was in terms of the percentage increase in sales necessary to bring about full shifting. This skirts the whole problem, because to know the actual degrees of shifting, one would have to find out how much increase in sales actually took place due to the increase in the tax rate.

Lerner and Hendriksen,⁶ Clendenin⁷ and Adelman⁸ use basically the same approach of considering the movements of the profit rate vis-a-vis those of the tax rate over a twenty-five year period. The first two studies consider after-tax rate of return whereas the third considers before-tax profit share in GNP. The first two came to the conclusion that in the short run the tax was not shifted; but in the long run it was. Adelman came to the opposite conclusion as far as long run was concerned, but did not say anything about short run.

Statistically, these were not difficult to reconcile as Ratchford and Han⁹ showed. Increased turnover rate would

6 E.M. Lerner and E.S. Hendriksen, "Federal Taxes on Corporate Income and the Rate of Return on Investment in Manufacturing, 1927 to 1952," National Tax Journal, Vol. 9, September 1956, pp. 193-202.

7 Clendenin, J.C., "Effects of Corporate Income Taxes on Corporate Earnings," Taxes, Vol. 34, June 1956, pp. 391-398.

8 M.A. Adelman, "The Corporate Income Tax in the Long Run," Journal of Political Economy, Vol. 6, April 1957, pp. 151-157.

9 B.U. Ratchford and P.B. Han, "The Burden of the Corporate Income Tax," National Tax Journal, Vol. 10, December 1957, pp. 310-324.

raise absolute profits enough to neutralize loss due to tax, so that after-tax rate of return was maintained at the same level. But increased turnover would be reflected in the denominator and the numerator both of the profit share indicator, keeping the before-tax profit share relatively constant. So the answer depends on the indicator chosen. Slitor, after a careful analysis of the apparent conflict, comes to a conclusion that the tax was in all probability borne by the companies themselves.¹⁰

The whole controversy, however, seems futile in hindsight, particularly in view of the warning given by Coates cited above. Both the studies are wrong in their methodology: their conclusions can be valid only if the non-tax influences cancelled each other out, which would be indeed too convenient to expect! Once a proper analysis of the various factors affecting the shifting indicator is done, it is bound to take into account effects on the denominator as well, and the results from such complete studies cannot differ substantially. The role of non-tax factors was recognized by these studies, but they did not realize the full impact. We have referred to only a few of such studies here (which are the best-known), but there were actually a number of such studies in U.S.A. Another glaring defect in these studies is the absence of a precise and consistent definition of shifting. This resulted in confusion in interpreting their results. Lerner and Hendriksen, for example,

¹⁰ Richard E. Slitor, "The Enigma of Corporate Tax Incidence," Public Finance, Vol. 18, No. 3-4, 1963, pp. 328-52.

ascribe the rise in rate of return to shifting, facilitated by higher capital turnover. If the rise was indeed due to capital turnover, it cannot be called shifting, because it would have taken place in the absence of the rise in tax rate also. To call it shifting, one has to show that the rise in turnover itself was due to the rise in tax rate only. In fact, one could say that the methodological error stems from the lack of a precise definition of shifting. Once it is defined as the ceteris paribus effect of the tax rate on profit rate, it becomes clear that separating the tax effect from the variety of non-tax effects is the crux of the problem.

3.1.2 Econometric Studies

The econometric studies started with the trail-blazing work of Marian Krzyzaniak and Richard Musgrave,¹¹ who in the process, threw the problem in sharp focus, very clearly defining the problem. The results and the technique adopted have been hotly contested, but to date, it remains the most important study in the field of corporate income tax shifting.

They clearly saw the problem for what it was and decided on a multiple regression technique to single out the effect of corporate income tax rate on the rate of return (although they used profit share too as the index of shifting, their obvious preference was for the rate of return indicator). Multiple regression technique is theoretically well-suited for this

¹¹ Marian Krzyzaniak and Richard Musgrave, Shifting of the Corporation Income Tax, Johns Hopkins University Press, Baltimore, 1963.

kind of analysis, but actual application poses many problems. The first major hurdle is to find a specification which is theoretically acceptable and also statistically permissible. This, in a way, is the major problem in applied econometrics. The actual form of the regression—linear, log-linear, or non-linear—had to be specified. Also, in case of single equation estimation, one has to satisfy oneself that the equation is in the reduced form and no simultaneity bias is present. Otherwise, a simultaneous equations system has to be estimated. Nevertheless, Krzysaniak and Musgrave (henceforth called K-M) carried out such an exercise.

They defined shifting in terms of the tax liability rate (defined as the ratio of tax liability to capital), which was denoted by L . But they tested two alternative hypotheses as to the tax-rate taken into account by the corporation: the effective tax rate (defined as tax liability as a ratio of profits before tax), called Z_t^* , and L_t . Z_t^* was replaced by Z_t (the statutory tax rate) also for some estimations. These two formulations were called model A (using L_t) and model B (using Z_t and Z_t^*). In case of model A, the shifting measure coincided with the coefficient of L_t whereas in the other case, it varies every year as it is the coefficient of Z_t divided by the gross (before-tax) profit rate. This will be fully discussed later.

They sketch a macroeconomic model which they claim to be the structural equations from which they draw the following reduced forms:

$$Y_t^E = a_0 + a_1 \Delta C_{t-1} + a_2 V_{t-1} + a_3 J_t + a_4 L_t + a_5 G_t + a_6 L_{t-1} + U_t \quad \dots (3.1)$$

$$Y_t^E = b_0 + b_1 \Delta C_{t-1} + b_2 V_{t-1} + b_3 J_t + b_4 Z_t + b_5 Z_{t-1} + b_6 Z_{t-1} + V_t \quad \dots (3.2)$$

where Y_t^E = gross (before-tax) rate of return;

C_{t-1} = Consumption (lagged by a year) divided by GNP;

V_{t-1} = ratio of inventory to sales (one year lagged);

J_t = all other tax collections minus government transfers divided by GNP;

G_t = ratio of federal purchases to GNP; and

U_t and V_t are the disturbance terms.

(3.1) represents model A and (3.2) represents model B. In model A, L_t is not independent of U_t since $L_t = Z_t Y_t^E$ definitionally and hence cannot be properly used as an independent variable. Therefore, K-M had to resort to the instrumental variable method, using Z_t and Z_t^* alternately as instruments. In case of model B, this problem did not arise, and it could be estimated using ordinary least squares.

The preferred equation of the K-M study was that of model A without the lagged tax rate and G_t variables,

$$Y_t^E = .2859 + .4038 \Delta C_{t-1} - .5272 V_{t-1} - .8333 J_t + 1.3394 L_t$$

(2.6690) (-3.0043) (-4.7168) (12.2165)

$$R = .9765$$

The shifting estimate is thus 134 per cent. The estimate of shifting through model B also is much higher than 100 per cent.

K-M carried out some further experiments also. Notable among them were two results. They used the differential tax rate (between corporate and non-corporate sectors), and the shifting estimates did not change very much. Another interesting finding was that a sort of 'ratchet effect' in the shifting process is present. The burdens of increases in tax rate were being shifted, but not the benefits of reductions.

It has to be noted that K-M do not want too much reliance to be put on the exact shifting estimates. They feel that it has to be toned down because of inflation, and the omitted federal purchase variable would contaminate the results with balanced-budget effects. They are ultimately satisfied with the statement that their results support the hypothesis of full-shifting strongly.

An avalanche of comments on this study followed it starting with two comments by Richard Slitor and Richard Goode.¹² These were followed by comments by Cragg, Harberger and Mieszkowski¹³ (henceforth called C-H-M), Gordon,¹⁴

12 The papers by Slitor and by Goode, the response by K-M, and a joint rejoinder by Slitor and Goode are contained in the volume M. Krzyzaniak (ed.), Effects of the Corporation Income Tax, Wayne State University Press, Detroit, 1966.

13 J.C. Cragg, A.C. Harberger and P. Mieszkowski, "Empirical Evidence of the Incidence of the Corporation Income Tax," Journal of Political Economy, Vol. 75, December 1967, pp. 811-821. Also see the K-M "Response" in Vol. 78, July-August 1970, pp. 768-773 of the same journal and the C-H-M "Rejoinder" in pp. 774-777 of the same issue.

14 R.J. Gordon, "The Incidence of the Corporation Income Tax in U.S. Manufacturing, 1925-62," American Economic Review, Vol. 57, September 1967, pp. 731-758. See also the K-M "Comment", in Vol. 58, December 1968, pp. 1358-1360 of the same journal.

Brown¹⁵ and others. Instead of dealing with them one by one, we will outline the points made briefly.

The first major criticism is that their rate of return equation is introduced in a cavalier manner without a theoretical discussion about the individual variables. Their significance and relevance is nowhere explained. The structural system is provided as if they added it on as an afterthought. The choice of variables is not justified on any grounds by K-M. They mention that experiments led to the specification used but the experiments are not reported.¹⁶ The particular form used of the explanatory variables also need to be explained. Lagging V_t and ΔC_t by a year to explain rate of return seems very strange to many. The use of J_t is considered dubious because a priori one does not know what sign to expect for its coefficient. The government expenditure variable is included in the specification and because it turns out to be insignificant it is dropped; later, K-M want to tone down the shifting estimate because balanced-budget effect might have been captured by the tax rate. The statement seems to contradict their results. To sum up, the specification has not been bolstered enough with theoretical reasoning.

15 E. Cary Brown, "Recent Studies of the Incidence of the Corporate Income Tax," in W.L. Smith and J.M. Culbertson (ed.), Public Finance and Stabilization Policy, North Holland, Amsterdam, 1974, pp. 93-108.

16 At one place they mention that they had considered using sales and quantity as explanatory variables, which they dropped later on the advice of Carl Christ, as they were endogenous.

The second major criticism is about the omission of a variable to represent cyclical fluctuations. The critics claim and demonstrate that introduction of such a variable (ratio of actual to potential GNP, or employment rate, or capacity utilization rate) brings down the coefficient of the tax rate substantially. Omission of a productivity variable is also criticised.

The third major criticism which came from Gordon is about their estimation technique. He observed that the preferred model A has L_t in the explanatory variables which actually requires non-linear estimation. K-M use instrumental variable method which is an inferior short-cut. Also, non-linear estimation, as shown by him, pulls down the shifting estimate somewhat.

The test of plausibility (or backward prediction) is done by extending the equation to predict for the excluded years. K-M equation fails in this test. Besides these major points, there were some minor criticisms about the definition of the tax rate, the exclusion of the war years (instead of using the data for those years along with a dummy variable), and so on.

The criticisms, however, do not seem to be valid in their entirety. K-M have tried to refute all the major criticisms levelled against them.¹⁷ They agreed that their model was not as comprehensive as they would have liked it to be. The nature of the structural system is such that it involves

17 Footnotes 12, 13 and 14 give the necessary references.

model estimation on a large scale, with accompanying rise in the risk of possible pitfalls. They do not claim to have an absolutely proper reduced form, but their specification is claimed to be a close approximation of it, without any simultaneity bias. They are also constrained by the limited number of observations at their disposal.

K-M do not agree to the introduction of a cyclical variable as an independent variable, because they believe it would be endogenous, determined partly by the tax rate itself. The consequent reduction in the coefficient of the tax rate, they argue, is because the cyclical variable used (pressure variable advocated by Goode and Slitor, and employment rate advocated by C-H-M) captures part of the tax effect. They feel that their variables, particularly ΔC , J and G capture cyclical fluctuations adequately.

The use of dummy variables (advocated by C-H-M) is also objected to by K-M, asserting that eliminating those observations is a better procedure. They also point out that the shifting estimate comes down to significantly less than unity only when both the cyclical variable and the dummy variable are used. Use of any one of these variables brings down the coefficient of the tax rate, but it still lends support to the full-shifting hypothesis. To quote K-M, "In all, we grant that the value of our results would be greatly reduced if the tax coefficients were shown to be quite sensitive to admissible changes in specification of the estimating equation. We do not deny the possibility that a more ambitious model, applied

to a larger number of observations, may in time yield different results. This, after all, is a very difficult problem to tackle by quantitative techniques. We do not think, however, that the critics have shown the model to be unreliable nor is this suggested by the further experimentation which we have undertaken."¹⁸

Regarding plausibility tests also, Goode's criticism of K-M is not on a very sound base. When K-M excluded the depression and the war years, they did so because those were extremely abnormal years. To extend their equation meant for relatively normal years to those abnormal years, and criticising it on its failure to predict correctly seems unjustifiable. The other test of Goode was to predict the 1955-57 rates of return using K-M equation with a constant tax rate. Criticising them as being unrealistic can hardly be called objective, because it heavily hinges upon one's conception of what the rates of return would have been in the absence of the rise in the tax rate. Such predictions, when compared with actuals, do not provide any ground for a criticism. His alternative profit function based solely on capacity utilisation compares well with the actuals when extended to 1936-39 and 1955-57, but fails miserably when extended back to 1927-29 by K-M.

Gordon's criticism of K-M adoption of instrumental variable method is also not very strong when examined thoroughly.

¹⁸ "Discussion" in Krayzaniak (ed.), op.cit., p. 252.

First, non-linear estimation still contains some unknown qualities whereas the linear estimation has been probed thoroughly for limitations. Hence, we are on firmer ground with the latter. Second, the circumstances were favourable for the use of the instrumental variable method, because a good instrument was readily identifiable. Third, Gordon's demonstration of the superiority of the non-linear estimation over K-M method is not all that convincing. It was done with not the preferred equation estimated by K-M, but the complete equation (including explanatory variables which K-M found to be insignificant). This leaves some doubt as to the superiority of the non-linear estimation with respect to the preferred equation. The improvement in prediction due to non-linear estimation is marginal, according to Gordon himself. Most important, the non-linear estimation of K-M specification yields a tax rate coefficient of .92, which again supports full-shifting hypothesis. His alternative specification, which supports zero-shifting, is a different proposition altogether, and by itself, cannot constitute a criticism of K-M analysis.

The criticism about including loss-making companies in the analysis was answered by K-M subsequently. They showed that exclusion of those companies do not change the results except marginally.

The spate of criticism against the K-M study is implicitly caused by their result of more than full-shifting. There are two misconceptions involved here. First, the critics attach too much significance to K-M's point estimate of shifting

(134 per cent). K-M have emphasized the fact that it is not to be accepted as such, but only as a support to full-shifting hypothesis. The critics conveniently forget or ignore it, and consequently are consterned at the possibility that raising tax rate may actually raise the net rate of return of the corporations. Another group of critics find it difficult to believe that given the 50 per cent corporate tax rate, if the tax was suddenly abolished, the gross rate of return would come down by half, which the K-M results of full shifting seems to imply. This group also is guilty of ignoring a part of K-M results, which says that the increase in tax rate is passed on in full, but not the decrease.

Secondly, the criticisms may be too harsh for the reason that the critics believe the K-M results to fly in the face of economic theory. A typical outburst is from Slitor: "The finding of short-run shifting transcends in importance the relatively narrow question of who pays the corporate tax since it conjures up a strange new world in which neoclassical theories of the firm, the competitive structure, and the marginal cost - marginal revenue equilibrium are relegated to the scrap heap."¹⁹ Goode also gives vent to similar feelings: "A well-supported finding of widespread short-run shifting of the whole corporate tax would constitute a devastating criticism of price

¹⁹ Richard Slitor, "Corporate Tax Incidence: Economic Adjustments to Differentials under a Two-Tier Tax Structure," in Krzyzaniak (ed.), op.cit., p. 138.

theory and would suggest that businessmen were right all along in paying little attention to economists' talk about price determination."²⁰ These views imply that an empirical finding coming into conflict with established theory must be wrong. This stand is unscientific and dangerously dogmatic by itself. Such an event may be because the theory is not sufficiently realistic; the stand taken by Goode and Slitor and like-minded economists can be endorsed only to the extent that before contemplating revisions in theory, one must be reasonably sure of the empirical results. Moreover, the criticism of K-M on this score is highly exaggerated. As we noted in the previous chapter, short-run shifting is in no way precluded by theory, even in the case of perfect competition. Only an incomplete understanding of microeconomic theory would make one take such a stiff stand.

The K-M model has been used to compute tax shifting in West Germany, Canada and U.K., by Roskamp,²¹ Spencer²² and Davis²³ respectively, beside the application to Indian data

20 Richard Goode, "Rates of Return, Income Shares and Corporate Tax Incidence," in Kraysaniak (ed.), op.cit., pp. 209-210.

21 Karl W. Roskamp, "The Shifting of Taxes on Business Income: The Case of West Germany," National Tax Journal, Vol. 18, September 1965, pp. 247-257.

22 Byron G. Spencer, "The Shifting of Corporation Income Tax in Canada," Canadian Journal of Economics, Vol. 2, September 1969, pp. 21-34.

23 J.M. Davis, "An Aggregate Time Series Analysis of the Short-Run Shifting of Company Taxation in the United Kingdom," Oxford Economic Papers (New Series), Vol. 24, July 1972, pp. 259-286.

discussed in the next section. All three made some minor changes in the specification, keeping the basic equation the same as the K-M preferred equation. The following are the three equations estimated in the above-mentioned studies:

$$\text{Roskamp: } Y_t^E = a_0 + a_1 \Delta C_t + a_2 V_{t-1} + a_3 J_t + a_4 G_t + a_5 L_t + U_t ; \quad \dots (3.3)$$

$$\text{Spencer: } Y_t^E = a_0 + a_1 \Delta C_{t-1} + a_2 V_{t-1} + a_3 J_t + a_4 X_t + a_5 L_t + U_t ; \quad \dots (3.4)$$

$$\text{Davis : } Y_t^E = a_0 + a_1 \Delta C_t + a_2 V_{t-1} + a_3 J_t + a_4 E_t + a_5 L_t + U_t ; \quad \dots (3.5)$$

The notations are the same as in the K-M model, except for the two new variables, X_t and E_t . Spencer used X_t (merchandise exports during the year divided by GNP) as an additional variable, whereas Davis used E_t (market rate of return on no-risk bonds). Spencer also experimented with the pressure variable suggested by Slitor and Goode. However, it turned out to be insignificant, and was dropped.

All these studies yield results similar to K-M except the one by Davis. His point estimate of shifting is only 48 per cent using effective tax rate as the instrument for L_t . But when he drops ΔC_t and E_t on the grounds of insignificance, adding a spare capacity variable, the point estimate of shifting goes up to 85 per cent.

The rationale for using K-M specification meant to explain rate of return in U.S.A. to explain the same in other countries is supplied by Roskamp as "our belief that corporations in mixed capitalist economies have basically a very similar behaviour with respect to taxes on income and

property which is only slightly modified by different institutions."²⁴ But this belief may not be very well-founded. Many have criticised this particular belief without really showing the belief to be incorrect, but it was Davis who provided evidence against this belief.²⁵ He showed that except for Canada, the other studies indicate different directions of the effects of the non-tax independent variables. If Roskamp's (and obviously that of others applying the K-M model to countries other than U.S.A.) belief was correct, how can a variable, say J_t , have a statistically significant negative coefficient in U.S.A., and a statistically insignificant positive coefficient in West Germany?

A methodological assertion by Spencer needs mention in passing. Estimation of the structural system being impracticable due to limited number of observations and multiplying difficulties of specification, he prefers to go directly to the reduced form which he calls 'unconstrained'. It is unconstrained because the variables are based on intuition and statistical significance only. The only requirements are that there should be no multicollinearity and further introduction of admissible and predetermined variables should not substantially change the other coefficients. This viewpoint has certain amount of reasonableness, but is an extreme stand to

24 Roskamp, op.cit., p. 248.

25 J.M. Davis, "The Krzyzaniak and Musgrave Model - Some Further Comments," Kyklos, Vol. 26, No. 2, 1973, pp. 387-394.

take. Sometimes in empirical research it may become necessary to rely on intuition and statistical significance, but to completely ignore theory cannot be called a sound method. Even if it is not possible to derive an equation strictly from the structural system, the independent variables in the claimed reduced form must be shown to have a definite effect on the dependent variable, without which it will be impossible to distinguish spurious correlation from true relationships.

From the above discussion, it seems that the K-M model has been criticised more intensely than it deserved. It is not without shortcomings, to be sure, but as a pathbreaking piece of research, it certainly is laudable. The major weakness seems to be a lack of theoretical analysis, or even a rationalization of their results. A vital link in the chain, the specification, is thus very weak. However, one has to be sceptical about the indiscriminate use of this model for countries other than U.S.A. Its application to Canadian data and virtual duplication of the results is somewhat expected, since Canadian economy is akin to U.S. economy, but other countries may not have similar characteristics.

The second major econometric work done in this field was by Gordon.²⁶ The basic distinction between his approach and the K-M approach is that Gordon starts with a specific assumption of pricing, deriving his equation under that assumption,

26 R.J. Gordon, op.cit.

whereas K-M do not subscribe to any specific theoretical framework. Gordon's basic assumption is that of markup pricing.

He first derives his profit equation (for a no-tax world) for a representative firm. Sales are a function of price and output where the price is determined as a markup on the average cost at capacity output. Costs are a function of output, capacity, wage rates and materials prices. The difference between them is identically equal to profit, so that profits become a function of price, wages, output, capacity and materials prices. The data for wages and materials prices not being available, he assumes them to be functions of general price index and makes appropriate substitutions. This gives him the reduced form profit equation as:

$$Z_t^i = \alpha_1 \frac{R_t}{h_t} + \alpha_2 \frac{R_t^*}{h_t} + U_t, \quad \dots (3.6)$$

where Z_t denotes profits (or cash flow), R_t denotes sales, h_t denotes ratio of manufacturing prices to general price level, R_t^* denotes capacity sales (manufacturing prices multiplied by capacity output) and U_t denotes the error term. The prime on Z_t denotes a taxless world. The equation is standardized by using R_t (income originating in the corporate sector) or K_t (capital) alternatively. Two additional variables $\Delta Q_t/Q_t$ (Q_t referring to output) and $\Delta P_t/P_t$ (P_t referring to general price index) are added to the independent variables to take into account cyclical fluctuations and effect on profits through inventory valuations respectively. Finally, the tax rate variable is added on.

The estimation method adopted is non-linear multiple regression by Taylor expansion and iterative technique, unlike K-M, who use instrumental variable technique to avoid non-linear estimation.

The results indicate that shifting is not very different from zero for the whole manufacturing sector, taking either the rate of return or the profit share as the index of shifting.

The Gordon study has not attracted as much criticism as the K-M study, but it has not attracted as much attention as the latter either. K-M, in a comment on Gordon's work²⁷ conceded that a test of shifting through a rate of return equation which is properly reduced from a theoretically acceptable model would be superior to their work. But after being initially impressed, they find that later compromises rob the study of its superiority. They particularly object to the use of price as an independent variable, either on its own or to represent some other variable. This is because the effect of the tax rate variable on the profits (that is, shifting) will be through prices and wages. Including prices as an explanatory variable is bound to reduce the significance of the tax rate. Moreover, use of it as an exogenous variable clashes with their basic hypothesis of markup pricing. Similarly, shifting may also

27 M. Krzyzaniak and R.A. Musgrave, "Incidence of the Corporation Income Tax in U.S. Manufacturing: Comment," American Economic Review, Vol. 58, December 1968, pp. 1358-1360. See also the "Reply" by Gordon, pp. 1360-1367.

occur through changes in output and hence output is not an exogenous variable. Gordon, however, shows that even without the two offending variables (percentage changes in price level and output), the tax rate coefficient is not significantly different from zero.²⁸

K-M express their disappointment over the derivation of the claimed reduced form thus: "After a promising beginning with a behavioural price equation, we thus end up with an estimating equation, which is a far cry from being the reduced form of a refined structural system. ... Note that the tax variable is not introduced into the structural system as part of the price equation, but added at the end. Gordon's model, like ours, can thus not be used to explain the mechanism or direction of shifting."²⁹

Sebold³⁰ has charged Gordon with constraining the shifting coefficient through his model to be zero. His argument is that since prices are a markup on costs, having nothing to do with taxes, the most important avenue of shifting is closed by definition. In other words, Gordon's model has to yield a

28 E. Cary Brown, op.cit., demonstrated that the inclusion of $\Delta P/P$ and $\Delta Q/Q$ will bias the tax rate coefficient downward, but the extent is likely to be small.

29 "Incidence of the Corporation Income Tax in U.S. Manufacturing: Comment," op.cit., p. 1359.

30 Frederick D. Sebold, "Short-Run Tax Response in a Utility Maximization Framework," National Tax Journal, Vol. 23, December 1970, pp. 365-372.

result of no shifting. Gordon, in his reply,³¹ pointed out that this argument confuses between his model for a tax-less world and the real world. Since his data are generated from the latter, the argument is not valid. The shifting coefficient, in his estimation, measures the rise in profits through the rise in price beyond what would have occurred anyway. In other words, the shifting coefficient is a markup fraction different from the other one, considering taxes as a cost, free to take any value.

Davis used a model similar to the one used by Gordon to find out the degree of shifting in U.K.,³² in addition to the other models. He, however, did not have to make the controversial substitutions that Gordon had to, because data for the original variables were available. Thus, his estimation is less open to the criticisms levelled against Gordon.

The results obtained by Davis show that shifting is not significantly different from zero in U.K. However, using the differential profits tax rate (an approximation of the differential between the corporate and non-corporate sector), shifting estimates vary between 67 per cent and 135 per cent. This, he conjectures, may support the Harberger contention that capital

31 R.J. Gordon, "Specification Bias and Corporate Tax Incidence," National Tax Journal, Vol. 23, December 1970, pp. 365-372.

32 J.M. Davis, "An Aggregate Time Series Analysis of the Short-Run Shifting of Company Taxation in the United Kingdom," op.cit.

moves out of the heavily-taxed sector to the relatively lightly-taxed sector.

The third major econometric work in this field was by Challis A. Hall, Jr.³³ His study has a basic difference as compared to K-M and the Gordon study. Both K-M and Gordon have a framework which is basically applicable to a firm, which they generalized for the corporate sector or the manufacturing sector. Hall's approach is basically aggregative. He starts from the marginal productivity theory, postulating that long run factor shares are primarily determined by their productivity. Short run factor shares, then, can be accounted for by adding suitable explanatory variables to the productivity variable (which determines the long run trend), which in turn is determined by technology. Gordon also realized the importance of productivity, but it entered his model in an ad hoc manner, whereas production functions are the cornerstone of Hall's analysis.

Hall used the method suggested by Solow to 'purge' the output series of technological improvements, assuming neutral technological progress. This was done by deducting from the output series the increase in marginal productivity of capital. This, in turn, was inferred from the factor shares and three alternative assumptions about shifting were used (no shifting,

³³ Challis A. Hall, Jr., "Direct Shifting of the Corporation Income Tax in Manufacturing," American Economic Review (Papers and Proceedings), Vol. 54, May 1964, pp. 258-271.

forward shifting and backward shifting) to arrive at the before-tax factor shares.

Thus, corresponding to each shifting assumption, a different series of deflated output was obtained. These were used to fit production functions, and the shifting assumption underlying the best was accepted as the most probable. The best was evaluated primarily on the basis of the R^2 values and also the reasonableness of the fitted function.

Hall used data for U.S. manufacturing for the years 1919-1959 and concluded that the evidence was in favour of the no-shifting hypothesis. Cobb-Douglas and linear, two types of production functions were tried, both yielding the same result. The explanatory power for all the production functions, however, were pretty high (above 0.9), though relative performance was better when no-shifting assumption was adopted.

Musgrave, in his comment, criticised the use of the Solow method as "an exceedingly delicate reed on which to hang an incidence analysis".³⁴ Moreover, he was also sceptical about the ultimate choice of appropriate shifting hypothesis because the differences in R^2 values were not large enough to permit a confident choice, particularly when no statistical test of significance was undertaken.

Hall's study is difficult to assess properly because of the lack of details. The only published paper was the one we

³⁴ "Problems in Taxation: Discussion," American Economic Review (Papers and Proceedings), Vol. 54, May 1964, p. 301.

have mentioned above, which did not give full details.³⁵ The crucial part, deflation of the actual output series taking out the increased production due to technological progress, is not fully explained.

Joan Turek applied the same basic approach in a slightly modified form to a more recent set of data.³⁶ Essentially, she makes four departures from the Hall approach: (a) she uses technical change and tax rate variables together in the regression; (b) the production function used is CES (constant elasticity of substitution), allowing for non-neutral technical progress; (c) the actual regression uses wage-rental ratio as the dependent variable rather than output, because unlike Hall she does not estimate the production function, but an equation derived from it; and (d) she uses a cyclical variable explicitly— U_t/U_{t-1} , U denoting unemployment. She also uses a dummy variable to account for the change in classification in the year 1947. The final equation estimated is

$$w/R = \delta (1 - z)^v \frac{E_k(0)K}{E_l(0)L} e^{\rho} (\varphi - \lambda)t U^a (U/\bar{U})^b K^D \dots (3.7)$$

In logarithmic form it becomes

35 Perhaps he proposed to publish the full details subsequently, but was prevented from doing so due to his untimely demise.

36 Joan L. Turek, "Short-Run Shifting of the Corporate Income Tax in Manufacturing, 1935-1965," Yale Economic Essays, Vol. 10, Spring 1970, pp. 127-148.

$$\begin{aligned} \text{Log}(W/R) = & \log \delta + v \log(1-Z) + \varphi \log [E_K(0)K/E_L(0)L] \\ & + \varphi (\varphi - \lambda)^t + a \log U + b \log(U/\bar{U}) + D \log K, \dots (3.8) \end{aligned}$$

where W is wages, R is total capital payments, δ is the wedge representing monopoly rentals, Z is the effective tax rate, K is capital, L is labour, E represents efficiency (assumed to grow at geometric rates), U represents unemployment and K is the dummy variable. \bar{U} denotes one-year lagged value of U . φ and λ are the geometric rates of growth of capital and labour respectively. $\varphi = (1 - \sigma)/\sigma$, where σ is the elasticity of substitution.

Various definitions of profits and tax rates are adopted to check for the sensitivity of the results. The coefficient of the tax rate, v , yields the degree of shifting directly. It should be noted that the degree of shifting here is not the usual K-M type, but with relation to wage-rental ratio. If the tax has, say, an equal positive effect on wages and profits, this measure will not reveal any shifting, but K-M measure will. Thus, zero-shifting result using this type of analysis is not incompatible with positive shifting result using K-M type analysis. The latter type measure, it should be added, corresponds more to the usual definition of shifting.

The results yield tax rate coefficients varying between .0034 and .3497. Most of them are insignificant implying zero shifting, but Turek is satisfied with the statement that "some degree of shifting may occur but the magnitude is much less

than that implied by K-M's results".³⁷ She also duplicated Hall's approach with a CES production function and zero-shifting hypothesis again seems more plausible.

However, there is one point mentioned by Turek which is worth noting here. Various corporations consume products of other corporations, and to the extent they do it, any shifting done by the corporate sector boomerangs on itself. The effective aggregate degree of shifting is likely to be less, therefore, than the estimated degree of immediate shifting. To know what it is, one would need to know the effect of the tax on the input prices paid by the corporate sector.

Kilpatrick's study³⁸ uses an indirect approach to shifting. He tested the hypothesis that profit rate depended upon monopoly power (denoted by concentration ratio) under the assumption that there is a direct relation between monopoly power and shifting.

The hypothesis was tested by a cross-section multiple regression analysis of the determinants of the percentage change in industry profit rates - for a pair of years with the Korean War between them. Various pairs of years were considered. Various tax rates were also considered, but primarily it was the effective tax rate, taking into account profit-making

37 Ibid., p. 143.

38 Robert W. Kilpatrick, "The Short-Run Forward Shifting of the Corporation Income Tax," Yale Economic Essays, Vol. 5, No. 2, 1965, pp. 355-420.

companies only. Whatever the tax rate chosen, it rose substantially during the Korean War.

Besides concentration ratio, other variables used in explaining the profit rates were a dummy variable for market segmentation, change in production, wages, materials prices, output per man-hour, profit margin, share of non-corporate sector in output, rate of depreciation with respect to net worth, and share of wages and prices paid for materials in total output. After removing the insignificant variables, the final regression was

$$p_1/p_0 = a + b_1C + b_2P_0 + b_3Z_1/Z_0 \quad \dots(3.9)$$

where p_1 is the rate of return, C is the concentration ratio and Z is the deflated value of the output, with the subscript 0 denoting the prewar observation and 1 denoting the postwar. Cross-section data for over one hundred industries, comprising almost the whole manufacturing sector, were used. Concentration ratio proved to be highly significant in all the variants of the equation, pointing to a strong relationship between monopoly power and profit rate.

Kilpatrick devised a way of calculating the point estimate of shifting with the help of the coefficient of concentration estimated and the tax rates prevalent in the two years.³⁹ These estimates varied between 75 per cent and 126 per cent. This made Kilpatrick conclude that shifting was significantly greater than zero.

39 See ibid., pp. 368-373.

The theoretical reasoning on which Kilpatrick's analysis stands, is, to put it mildly, incomplete. It is one thing to say that ceteris paribus, monopoly power facilitates shifting; but to say that they are positively related in fact is a different thing altogether. First, there are many other factors operating. Second, for shifting to take place, a part of that monopoly power must remain unused, which comes into play with the imposition (or increase in the rate) of the tax. His measure of shifting, moreover, is derived under the assumption that the change in profit rates can be completely ascribed to concentration and change in the tax rate, which is hardly correct.

The next study to be analysed is that by Oakland.⁴⁰ He assumes perfect competition and also assumes that the marginal productivity theory holds. With these assumptions he outlines a model of the determination of rate of return and derives a rate of return function, allowing for technical progress and cyclical fluctuations. In this sense, his analysis is similar to that of Turek. He estimates the profit function without a tax rate variable, then adds the tax rate variable as an explanatory variable, and observes whether it has any impact on the earlier estimation.

⁴⁰ William H. Oakland, "Corporate Earnings and Tax Shifting in U.S. Manufacturing, 1930-1968," Review of Economics and Statistics, Vol. 54, August 1972, pp. 235-244.

Since he uses a multiplicative format, he estimates the functions in a log-linear form:

$$\text{Log}(F/pK) = b_1 + b_2 \log M + b_3 t + b_4 \log U + b_5 \log U_{-1} + e, \dots (3.10)$$

without the tax rate. When the tax rate is included, another term, $b_6 \log(1-Z)$ is added to the right hand side. He also experiments with $\log q$ instead of $\log M$ and $\log t$. The notation is as follows:

- F = Cash flow (profits plus depreciation);
- p = Price of capital goods;
- K = Stock of capital;
- M = Labour/capital ratio assuming full employment;
- t = Calendar year minus 1929;
- U = Capacity utilization;
- Z = Effective tax rate; and
- q = Potential output/actual output.

The negative of the coefficient of $(1-Z)$ gives the degree of shifting. The period for which the study is done is 1930-1968, and it covers the manufacturing sector of the U.S.

The results show that substitution of $\log M$ and $\log t$ by $\log q$ is not desirable. Moreover, the substitution brings in autocorrelation.

The insertion of tax rate variable does not change the equation noticeably. The coefficient of it is insignificant and other coefficients do not change appreciably. This shows that shifting is not significantly different from zero.

But the analysis suffers from a number of statistical

shortcomings not immediately apparent. The two variables q and U represent the same economic process, namely, the cyclical fluctuations. Use of the two together seems strange. Similarly U and U_{-1} may also be correlated, giving rise to multicollinearity. The use of t to represent technical progress is likely to detrend profit rate actually, and since tax rate is not detrended, it may cause the coefficient of the tax rate to become insignificant. Also use of tax rate and M , or q , or U together is open to the objection raised by K-M, namely, that the latter variables may capture the effect of the tax rate. For these reasons, Oakland's study cannot be construed as evidence to support zero-shifting hypothesis.

The last study to be discussed in this section is that by Beath for U.K.⁴¹ This relies, like Gordon's study, on the markup theory to provide a theoretical basis. But there is a major difference in that Beath brings in expectations, whereas Gordon confined himself to actual values. Beath considers a price equation which contains expected costs and expected rate of tax as arguments along with the markup parameter. The tax

41 John Beath, "Target Profits, Cost Expectations, and the Incidence of the Corporate Income Tax," Review of Economic Studies, Vol. 46, July 1979, pp. 513-525. Other econometric studies are reviewed in the following subsection. One important study not reviewed here, however, is that of Robert Levesque for Canada, which the author could not obtain despite his best attempts. A review of his work, however, is available in Balbir S. Sahni and T. Mathew, The Shifting and Incidence of Corporate Income Tax, Rotterdam University Press, 1976. This book is, in fact, a review of the literature on the subject, slightly outdated now.

rate considered is essentially an effective tax rate, though a little more complicated. The absolute tax liability is calculated as

$$T = t [\pi(1 - i) - C] + t_d \pi_d - G \quad \dots(3.11)$$

where t is the normal statutory tax rate, π is total profits inclusive of depreciation and interest payments, i is the ratio of interest payments to total profits, C is capital consumption (depreciation) allowance, t_d is the tax rate on dividends, π_d is dividends distributed and G stands for investment grants. Actually it boils down to normal tax liability on profits before tax, plus the tax liability on distributed dividends minus investment grants.

Four different hypotheses are used to generate a series of expected costs. The first is a simple model where the current cost is a linear function of the one-year lagged cost. After experimenting, it was found out that expected costs were equal to the one-year lagged costs, which relationship was used.

The second hypothesis used is the adaptive expectations model for the expected rate of change in costs.

The third was a variant of the second where the adaptive parameter was variable rather than a constant as in the second.

The second and third models assumed that actual rates of change were a linear function of these expectations starting from the origin (intercept = 0) and slope equal to unity. Thus, the actual rates of change were assumed to differ from the expected rates of change by a normally distributed error term only.

The fourth model directly applied the adaptive expectations process to the actual rate of change in costs. With the adaptive parameter equal to one, it would be the same as the first model.

The ultimate function estimated is not for rate of return or profit share, but for profit margin. Cyclical fluctuations are taken into account separately.

Since the dependent variable is profit-margin, the degree of shifting arrived at is not comparable to earlier (or subsequent) estimates. In fact, since the focus of the author is not on corporate tax shifting only but on explaining profits, he has neglected to give a proper measure of shifting. He chooses the more relevant hypothesis regarding determination of profits from the four mentioned above through some statistical tests and decides on the first model. To answer the question of shifting, he looks at the significance of the coefficient of the tax rate variable. Since it is significant, it is concluded that the tax has been shifted. An exact estimate of the degree of shifting is not put forward. The ultimate conclusion is that the tax rate influences the markup; and since evidence shows that declining tax rates have caused markup to decline, the conclusion reached is that of forward shifting.

3.1.3 Simultaneous Equations Estimations

K-M, in their pioneering study, estimate the single profit equation as the reduced form of a complete system of eight equations. They, of course, later agreed that the results

derived from the estimation of a complete simultaneous equations system would probably stand on a stronger footing. But it was left to Dusansky to initiate exercise in that direction.⁴²

Dusansky specified a sixteen-equation model with an endogenous tax variable. His technique of estimation is two-stage least squares method. The more important function from our present point of view is rate of return function which he postulates as

$$R = a_0 + a_1 \frac{I}{S} + a_2 \frac{M}{p} + a_3 \frac{W}{p} + a_4 O + a_5 \frac{L}{K} \\ + a_6 \frac{Y_a}{Y_p} + a_7 \frac{T}{K} + U \quad \dots(3.12)$$

where I = manufacturing inventory, S = sales, M = materials prices (index), p = aggregate price level, W = average annual compensation per full-time employee, O = output per man (annual percentage change), L = full-time equivalent employees, K = total assets, Y_a = actual GNP, Y_p = potential GNP, and R = gross rate of return (including interest payments). T being the corporate tax liability, a_7 is the coefficient which is the ultimate goal. Thus, the explanatory variables are inventory-sales ratio, raw materials prices (deflated), real wage rate, output per man, inverse of capital-labour ratio, the cyclical variable (Knowles ratio) and the tax rate. Method of two-stage least squares was used to estimate the equation for rate of return.

⁴² Richard Dusansky, "The Short-Run Shifting of the Corporation Income Tax in the United States," Oxford Economic Papers (New Series), Vol. 24, November 1972, pp. 357-371.

The equation estimated this way, without dropping any variable was:

$$R = -0.539 - 0.468(I/S) + 1.427(M/P) - 0.183(W/P) + 0.041(O) \\ (1.76) \quad (3.21) \quad (0.18) \quad (0.25) \\ + 0.253(L/K) + 1.051(T/K) - 0.06(Y_a/Y_p) \\ (1.56) \quad (5.63) \quad (0.12)$$

$$R^2 = 0.912 \quad D-W = 1.56 \quad (\text{t-values in parentheses}).$$

The shifting estimated, then, is 105 per cent. The cyclical variable (Y_a/Y_p) emphasized by Goode, Slitor, Gordon and C-H-M turned out to be insignificant.

Dropping insignificant variables did not alter the full-shifting result. Use of capital-output ratio instead of using O and L/K also did not change the results. Thus, this result firmly supported the K-M finding of full shifting in the U.S.

The same sort of analysis was applied to Canadian data by Dusansky and Tanner.⁴³ The rate of return function is exactly the same. In this case also, the cyclical variable is insignificant, but the shifting estimate is substantially lower than 100 per cent. It ranges between 67 per cent and 73 per cent, the preferred estimate being 73 per cent.

This type of analysis is preferable to single-equation estimation method for the reason that possible simultaneity bias is removed. But it has one difficulty. The amount of data necessary is, by the nature of the method, quite large.

⁴³ Richard Dusansky and J. Ernest Tanner, "The Shifting of Profits Tax in Canadian Manufacturing," Canadian Journal of Economics, Vol. 7, February 1974, pp. 112-121.

The probability of misspecification and also measurement errors increases with the increase in the size of the model to be estimated. Moreover, a limitation of this type of analysis (estimating only the rate of return equation in the second stage) is that we are as much in the dark about the method of shifting as ever.

The above limitation was removed by Sebold in his simultaneous-equations estimation of corporate tax shifting in the U.S. for the years 1931-70, excluding 1941-46.⁴⁴ This model consists of seven stochastic equations and two identities. The stochastic equations are estimated using the method of two-stage least squares again, but here all the equations are estimated. There is no profit equation, but an identity involving profits. The corporate effective tax rate is itself an endogenous variable. The various equations are based on established empirical results with necessary modifications. The key equations are five: the price equation, the wage equation, the depreciation equation, the raw materials prices equation, and the tax rate equation. These equations, as estimated, are:

$$\begin{aligned} \log(p) = & .97118 + .57144 \log(WN/Q) + .25067 \log(p^M W/Q) \\ & \quad (11.5068) \quad \quad \quad (6.4494) \\ & + .14677 \log(K/Q^*) + .02276 \log(Q/Q^*) \\ & \quad (3.3773) \quad \quad \quad (0.5631) \\ & - .05784 \log(1-v) - .06324 PWD - .03399 KWD \\ & \quad (2.7981) \quad \quad \quad (4.0177) \quad \quad (2.8408) \end{aligned}$$

$R^2 = .9988; \quad D-W = 2.0895; \quad F = 4029.5.$

⁴⁴ Frederick D. Sebold, "The Short-Run Shifting of Corporation Income Tax: A Simultaneous Equations Approach," Review of Economics and Statistics, Vol. LXI, August 1979, pp. 401-409.

$$\begin{aligned} \Delta \log(W) = & .06572 + \frac{.57883}{(5.569)} \Delta \log(p) + \frac{.15408}{(2.701)} \log(Q/Q^*) \\ & + \frac{.37986}{(2.609)} \Delta \log(Q/N) + \frac{.02458}{(0.771)} \log(1-v) \\ & + \frac{.01760}{(0.794)} \text{KWD} + \frac{.20842}{(5.465)} \text{PWD} \end{aligned}$$

$$R^2 = .891; \quad D-W = 1.825; \quad F = 46.559.$$

$$\begin{aligned} \log(D/K) = & -.33575 - \frac{.10470}{(3.181)} \log(1-v) + \frac{.13464}{(3.335)} (D \ 1962) \\ & + \frac{.08874}{(2.226)} (D \ 1954) + \frac{.87880}{(27.122)} \log [D(-1)/K(-1)] \end{aligned}$$

$$R^2 = .981; \quad D-W = 1.822; \quad F = 410.844.$$

$$\begin{aligned} \log(p^m) = & .00834 + \frac{.00614}{(0.553)} \log(Q/Q^*) - \frac{.92129}{(5.923)} \log(M/Q) \\ & - \frac{.15462}{(2.657)} \log(1-v) + \frac{.13320}{(1.503)} \log(K/Q^*) \\ & + \frac{1.06086}{(2.702)} \log(\text{UCLM}) - \frac{.0092}{(1.168)} \text{KWD} - \frac{.00466}{(1.168)} \text{PWD} \end{aligned}$$

$$R^2 = .933; \quad D-W = 1.949; \quad F = 215.866.$$

$$\begin{aligned} \log(1-v) = & -.88253 + \frac{1.04458}{(3.211)} \log(1-v_1) + \frac{.02705}{(0.122)} \log(1-v_2) \\ & + \frac{.28160}{(0.657)} \log(1-v_3) + \frac{.36759}{(3.346)} \log(1-v_4) + \frac{.02360}{(0.563)} \text{ITC} \\ & - \frac{.11994}{(1.295)} \text{PWD} - \frac{.02937}{(0.440)} \text{KWD} - \frac{.36710}{(1.934)} \log(Q/Q^*) \\ & - \frac{.35408}{(2.857)} \log(K/Q^*) \end{aligned}$$

$$R^2 = .870; \quad D-W=1.822; \quad F = 25.470.$$

where p = wholesale price index of products; W = average annual wage rate per full-time equivalent employee; Q = real corporate sales; N = employment (full-time equivalent); p^m = raw materials price index; M = real materials used; K = value of net capital assets; Q^* = full-capacity real sales; v = effective corporate tax rate; KWP = Korean War dummy (1 for 1946, 0 otherwise); PWD = post-war dummy (1 for 1946, 0 otherwise); D = depreciation; $D 1954$ and $D 1962$ = dichotomous variables representing special depreciation provisions in 1954 and 1962; $UCLM$ = unit labour cost in mining; v_1, v_2, v_3, v_4 = statutory corporate tax rates; and ITC = investment tax credit dummy (1 for 1962-68, 0 otherwise). All these definitions are in relation to corporate manufacturing sector. The functions estimated are double-log as can be seen.

The shifting is given by $(\pi - \pi')/v\pi$, where the prime denotes a hypothetical no-tax situation, and is given by the identity:

$$\pi = pQ - WN - p^m M - D + (OR - OC), \quad \dots(3.13)$$

where π is gross profits, OR = operating revenue and OC = operating costs.

Computed this way, the total shifting during the period was about 69 per cent. This was further broken up into shifting backwards onto labour, raw materials and depreciation and forward shifting onto consumers. The degrees were respectively, -33 per cent, -47 per cent, -5 per cent and 154 per cent. This means that although forward shifting is more than 150 per cent,

more than half the gain is passed on to labour, raw materials suppliers and depreciation.

This approach is the logical extension of the K-M analysis via Dusansky's contribution. The avenues of shifting are clearly shown and on technical grounds the work cannot be faulted. Even the effective tax rate is treated as endogenous, which pre-empt's any criticism on that score. Essentially, it is not very different from the Dusansky analysis except that all equations are explicitly estimated, and that specifications are different. If anyone has a quarrel with the specifications, it has to be pointed out that Sebold merely used already established specifications. Thus, except for refining the specifications, this particular approach of using multiple regression to determine the degree of tax shifting can be said to have reached its logical end. Taking the K-M study, the Dusansky study and the one by Sebold, the inescapable conclusion is that the U.S. Corporation Income Tax is shifted to a substantial degree.

3.1.4 Industry Studies

In the review so far, we have talked about aggregative studies only. A more disaggregated approach has been thought worthwhile by many and we discuss the few studies actually undertaken below.

First, the industry applications of basically aggregative studies will be discussed. The K-M study and Gordon's study (the same ones discussed in the previous section) can be put under this category.

K-M estimate shifting for seven industrial groups, as well as for groups formed using certain other criteria, using the same equation they postulated for the whole corporate sector. The estimations are done for the whole period, and only for the postwar years separately.

Taking industry groups, results for the whole period invariably reveal more than full shifting, the point estimates ranging from 123 per cent (textiles) to 158 per cent (pulp and paper). However, for postwar years, the results change with shifting in pulp and paper industry and also in food and kindred products industry showing statistically insignificant shifting coefficient. Degrees of shifting, generally speaking, are less when only the postwar years are considered.

Companies with assets more than \$ 50 million show more than full shifting during the whole period as well as only the postwar years. But companies with assets below \$ 50 million show insignificant shifting during the postwar years, though for the whole period, they too show more than full shifting.

Fifteen price leaders and 15 price followers were also separately considered by K-M. Both the groups show more than full shifting for the whole period as well as the postwar year only.

Gordon, in a similar fashion, uses the same equation for the aggregative as well as the disaggregated study. He considers ten industries, and the method of computation is exactly the same. The tax shifting varies widely from industry to industry,

with significant negative at one extreme to significant positive at the other. Four industries show significant positive shifting: paper (about 40 per cent), chemicals and petroleum (above 90 per cent), rubber (90 per cent), and stone, clay and glass (about 50 per cent). The weighted average for all industries is 11 per cent and 0.3 per cent for rate of return and profit share indicators respectively as compared to 11.5 per cent and 6 per cent obtained through the aggregate analysis. Gordon explains the difference in the degrees of shifting partly with the help of concentration, but contests the Kilpatrick contention that there is a direct relation between tax shifting and concentration.

This kind of studies, however, are not very useful because it is difficult to believe that a basically macroeconomic function will apply in a microeconomic (when disaggregated) situation as it is. Some variable to capture special industry characteristics should be used as an explanatory variable, or else there is a high risk of misspecification. For example, budgetary deficits may explain general price level, but its effect on the price of the product of a small industry, say pottery, is likely to be very small.

The first distinctly industry analysis to be discussed is that by Moffat.⁴⁵ He was not directly concerned with shifting;

⁴⁵ William R. Moffat, "Taxes in the Price Equation: Textiles and Rubber," Review of Economics and Statistics, Vol. 52, No. 3, 1970, pp. 253-261.

rather, his objective was to find out how far taxes affected price. Obviously, this would give an idea as to forward shifting, which has always been thought to be the main, if not sole, constituent of total shifting. He confines his analysis to two industries, Rubber and Textiles.

The methodology that Moffat adopts is to formulate different price equations based on four alternative pricing rules - profit maximization, target rate of return, markup rule, and sales maximization - and variations in these primary rules. A monopolistic structure is assumed. The resultant functions are given below:

Profit Maximization:

$$P = E_0 MC + K_2 \Sigma ED(MC), \quad \dots(3.14)$$

$$dP = E_0 dMC + K_1 \Sigma ED d(MC) + K_2 ED(MC); \quad \dots(3.15)$$

Profit Maximization (Brown Version):

$$P = E_0 MC + K_1 tMC + K_2 \Sigma ED(MC) + K_3 \Sigma ED(tMC), \quad \dots(3.16)$$

$$dP = E_0 dMC + K_1 dtMC + K_2 \Sigma ED dMC + K_3 \Sigma ED d(tMC) \\ + K_4 ED(MC) + K_5 ED(tMC), \quad \dots(3.17)$$

Profit Maximization (Penner Version):

$$P = K_1 + E_0 MC + K_2 \Sigma ED(MC) + K_3 t, \quad \dots(3.18)$$

$$dP = E_0 dMC + K_1 \Sigma ED dMC + K_2 ED(MC) + K_3 dt, \quad \dots(3.19)$$

Target Rate of Return (Gross of Tax):

$$P = R(UK) + UC, \quad \dots(3.20)$$

$$dP = R d UK + d UC, \quad \dots(3.21)$$

Target Rate of Return (Net of Tax):

$$P = \frac{RA}{(1-t)} UK + UC, \quad \dots(3.22)$$

$$dP = RA d [T(UK)] + d UC, \quad \dots(3.23)$$

Markup Rule (Gross of Tax):

$$P = PM(UVC), \quad \dots(3.24)$$

$$dP = PM d UVC, \quad \dots(3.25)$$

Markup Rule (Net of Tax):

$$P = PMA \frac{UVC}{1-t} - \frac{tUFC}{(1-t)^2} - \frac{tUFC}{(1-t)} + UVC, \quad \dots(3.26)$$

$$dP = PMA d \frac{UVC}{1-t} - \frac{tUFC}{(1-t)^2} - d \frac{tUFC}{1-t} + d UVC, \quad \dots(3.27)$$

Sales Maximization:

$$P = K_1 + K_2 E D \quad \dots(3.28)$$

$$dP = K_1 + K_2 E D \quad \dots(3.29)$$

The notations are as follows:

MC = marginal cost, ED = excess demand, t = effective tax rate, R = target rate of return (constant), UK = Unit Capital, UC = Unit Cost, RA = target rate of return (after tax), UVC = unit variable cost, UFC = unit fixed cost, PM = percentage markup, and PMA = percentage markup after tax. E_0 and the K's are constants free to take any value in each equation.

The formulations, as is apparent, are in both absolute price levels as well as changes in them. Combinations of different pricing rules are not impossible, which Moffat acknowledges. The equations under sales maximizations are for

periods when rate of return is above the minimum necessary level. When it is below that, the relevant pricing rule, in the same framework, becomes target rate of return.

These equations were estimated with data for the years 1924 through 1962, excepting the war years of 1942-46 and 1951-52. Estimation of some of the equations necessitated constraining some of the coefficients while computing the regression. After computation, the best pricing rule was decided upon on the basis of R^2 value of the estimated equation. Whenever autocorrelation was indicated by the D-W statistic, appropriate change in the estimating procedure was adopted.

The results indicated that the Penner version of profit maximization was the best for the textiles industry, with the Brown version coming a close second. In both versions, the coefficient of the tax rate was significant. In case of rubber industry, the Brown version was the best, followed by the Penner version, the coefficient of the tax rate variable again being significant. However, the total explanation was not very good, and after trying various combinations of variables, lags, separation of variables etc., the best equation that emerged was

$$P = K_1 + K_2 \text{ ULP} + K_3 \text{ UM} + K_4 \text{ ULO}_{-1} + K_5 \text{ UK} + K_6 \Sigma \text{ED} \dots (3.30)$$

$$\text{and } dP = K_1 d\text{ULP} + K_2 d\text{UM} + K_3 d\text{ULO}_{-1} + K_4 d\text{UK} \\ + K_5 \text{ ED} + K_6 dt_{-1} \dots (3.31)$$

where the new terms are ULP (unit production labour cost), ULO (unit non-production labour cost), and UM (unit materials cost).

With these results Moffat ventures the opinion that the corporate income tax has influenced the price in both textiles and rubber industries, though an exact estimate of shifting (in terms of the usual K-M measure) has not been arrived at. The fact remains that his results imply significant forward shifting.

The other study for tax-shifting at a disaggregated level is by Mikesell,⁴⁶ who examines tax shifting in regulated electric utilities in United States. He employed a type of rate of return equation which was familiar by then, but with an important difference. He considered tax rate as endogenous, thus having a two equation system to be estimated by the two-stage least squares - one for the rate of return and the second for the tax liability. The tax rate was the same as that used by K-M. The format of the equations was log-linear:

$$\log FK = a_0 + a_1 \log U + a_2 \log M + a_3 A + a_4 \log T, \quad \dots(3.32)$$

$$\log T = b_0 + b_1 \log S + b_2 \log D + b_3 \log U, \quad \dots(3.33)$$

where FK = before-tax rate of return inclusive of depreciation, U = Capacity utilization, M = Capital labour ratio, A = the year current minus 1947 (state of technology being assumed a function of time), T = effective tax rate, S = statutory tax rate, and D = debt-equity ratio.

Both the functions show reasonably good fits, though the tax rate function is comparatively less efficient. All the

⁴⁶ John J. Mikesell, "The Corporate Income Tax and Rate of Return in Privately Owned Electric Utilities, 1948-1970," Public Finance, Vol. 28, No. 3-4, 1973, pp. 291-299.

coefficients are statistically significant and as per Mikesell's claim, they also have the right signs. Actually, all but one of them do. It is difficult to understand how a negative coefficient for capacity utilization in the rate of return equation can be construed as expected. However, the crucial coefficient, a_4 , turns out to be 0.1127 - positive and significant. Translated into a shifting measure, the point estimate is 0.5768. Thus, roughly 58 per cent shifting takes place in American privately owned electric utilities.

Mikesell's results have been generally accepted as credible, primarily because regulated industries are theoretically likely to show shifting, and secondarily because his estimate of the degree of shifting is a believable middle one, unlike the aggregative studies which show a result of either full shifting or no shifting at all. This suggests that disaggregated studies are likely to be more useful, perhaps because very little aggregation bias (possibly present in aggregative studies) is present.

3.1.5 General Equilibrium Studies

The general equilibrium studies on tax incidence took roots only after an article by Arnold Harberger,⁴⁷ though it can be traced back to an article published in 1944 by Ronald Shepard.⁴⁸ However, Shepard's theoretical analysis was not

⁴⁷ Arnold C. Harberger, "The Incidence of the Corporate Income Tax," Journal of Political Economy, Vol. 70, June 1962, pp. 215-240.

⁴⁸ Ronald W. Shepard, "A Mathematical Theory of the Incidence of Taxation," Econometrica, Vol. 12, January 1944, pp. 1-18.

amenable to empirical work, particularly with the state of empirical analyses in those days. It goes to the credit of Harberger that he not only provided a simple (but not-too-abstract) model, but also demonstrated its empirical applicability.

Harberger's general equilibrium model is a two-sector (corporate and non-corporate), two-good (X, produced by corporate sector and Y, produced by non-corporate sector) and two-factor (capital and labour) one. Perfect competition in all markets is assumed. The factors are assumed to be paid according to their respective values of marginal products, where physical marginal productivity is determined by Cobb-Douglas production functions. These factors are assumed to be in fixed supply and fully employed. Complete mobility of the factors is assumed so that rate of wages and profits are fully flexible. All the functions are assumed to be continuous, so that differential calculus is used. By the very nature of it, initial distortions and large changes would probably make the model less useful.

An important methodological assumption is that all individuals and groups in the economy, including the government, have identical preference functions. This assumption abstracts the incidence of the tax burden from the incidence of the expenditures which is non-neutral only when the government expenditures change the demand schedules faced by various individuals and groups in the economy. Hence, the above assumption constrains the expenditure incidence to be neutral and so

the total effect is the incidence of the tax burden only. This also enables Harberger to avoid using a number of demand functions. Demand becomes a function of relative prices only.

The basic equations of this model are given by the demand function in the corporate sector, the production functions in both sectors, the definitions of elasticities of substitution in both sectors, Euler's theorem and the assumptions.⁴⁹

Denoting output of the corporate sector by X and its price by P_x and using Y for non-corporate sector, the following are the assumptions:

$$P_x \equiv P_y \equiv 1, \quad \dots(3.34)$$

$$dP_1 = 0, \quad \dots(3.35)$$

$$dK_y = -dK_x, \text{ and } dL_y = -dL_x \quad \dots(3.36)$$

L and K refer to labour and capital respectively.

The first assumption is met by changing units of output in the given figures. The second is the numeraire equation so that change in the price of capital calculated ultimately is relative to that of labour. The third follows from the assumption of full employment.

Taking derivatives of the basic equations and using marginal productivity theory as well as the three assumptions

⁴⁹ A complete mathematical derivation of the model has been given by Shoven and Whalley. See, John B. Shoven and John Whalley, "A General Equilibrium Calculation of the Effects of Differential Taxation of Income from Capital in the U.S.," Journal of Public Economics, Vol. 1, December 1972, pp.281-321, Appendix B.

given above for various substitutions and manipulations, one can derive the following system of three equations:

$$\left. \begin{aligned} E f_k T &= E(g_k - f_k) dP_k + f_l \frac{dL_x}{L_x} + f_k \frac{dK_x}{K_x} \\ 0 &= S_y dP_k - \frac{L_x}{L_y} \frac{dL_x}{L_x} + \frac{K_x}{K_y} \frac{dK_x}{K_x} \\ S_x T &= -S_x dP_k - \frac{dL_x}{L_x} + \frac{dK_x}{K_x} \end{aligned} \right\} \dots(3.37)$$

where E is the price elasticity of demand for X , f_l and f_k are relative factor shares in sector X , and g_k is the relative share of capital in sector Y . S_x and S_y represent the elasticities of factor substitution. T is the corporate tax rate per unit of capital.

Solving by Cramer's rule, one can derive

$$dP_k = \frac{E f_k (K_x/K_y - L_x/L_y) + S_x (f_l K_x/K_y + f_k L_x/L_y)}{E(g_k f_k) (K_x/K_y - L_x/L_y) - S_y - S_x (f_l K_x/K_y + f_k L_x/L_y)} \cdot T \dots(3.38)$$

This gives us the answer to the incidence question, since by assuming wage rate to be the numeraire, we are expressing dP_k relative to labour.

There is one important point hidden in these comparative static equations, which was brought out by Harberger himself later.⁵⁰ Because of perfect mobility of capital, the rates of return (either assuming away risk-differentials or assuming

⁵⁰ A.C. Harberger, "Efficiency Effects of Taxes on Income from Capital," in M. Krzyzaniak (ed.), Effects of Corporation Income Tax, op.cit., pp. 107-117.

rates of return to be inclusive of risks) must be equal in the two sector. With the introduction of the tax on corporate income, a wedge is introduced, which would push net rate of return in corporate sector below that obtaining in the non-corporate sector. This would start a process of outflow of capital from the corporate to the non-corporate sector until net rates of return are equalised. In the new equilibrium, gross corporate rate of return would be higher and non-corporate rate of return would be lower than in the earlier one. Thus, the burden of the tax will be 'exported' to some extent to the non-corporate sector.

The thing to be noted is that in this process, even if capital bears the whole burden of the tax, so that by Harberger methodology, the incidence is wholly on capital, it does not preclude partial shifting according to the K-M type definition of shifting. This is because, K-M type definition takes into account the rate of return in the corporate sector only, and since there the rate of return goes up to some extent as a result of the tax, such a definition would show some shifting.

For empirical application, Harberger divided the U.S. economy into corporate and non-corporate on the basis of tax paid. With the data on factor prices, output prices and output, he calculated the incidence of U.S. corporate income tax using various combinations of plausible values for the different parameters such as elasticities of substitution. The conclusion he arrived at was that the incidence is fully on capital.

He also estimated the waste in terms of national income arising due to the loss in efficiency caused by the tax. Although a debate is going on as to whether these two analyses i.e., incidence and measurement of waste, should be combined, it will be ignored here since our interest is limited to the shifting and incidence.

Theoretically, a general equilibrium analysis is superior to partial equilibrium analysis, particularly for broad-based taxes like the corporation income tax. It has primarily three advantages as compared to partial equilibrium analysis: (a) it enables one to consider the income-uses side along with the income sources side; (b) it allows integration of tax-incidence analysis with expenditure incidence analysis (or assumption, as the case may be); and (c) it allows one to consider the effect of the tax on the non-taxed sector and possible feedbacks in the taxed sector. The Harberger's analysis, however, sidesteps the first two issues and can claim no special advantage on those grounds. As for the third, a properly done partial equilibrium analysis with actual data can take these into account by using variables representing effects flowing from the non-taxed sector. Thus, in effect, except for the difference in definition of shifting and incidence, the kind of empirical work done by Harberger cannot claim to be greatly superior to econometric work. However, one must hasten to add that this does not imply that general equilibrium studies conceptually are not superior to partial equilibrium studies. But the short-cuts

one has to adopt for empirical applications severely reduces this superiority.

The Harberger analysis has had its share of criticisms. The assumptions have been criticised as too restrictive.

(a) First, the use of differential calculus for such an analysis has been criticised as not correct, because the tax changes are discrete and large, not small enough to permit use of differential calculus. Krauss, after pointing this out, showed that in some special circumstances this may alter the general results arrived at, though he did not question Harberger's empirical results.⁵¹ Shoven and Whalley, using a logarithmic approach rather than differential calculus, confirm Harberger conclusions.⁵²

(b) Shoven and Whalley raise some doubts about the division of the whole economy into two sectors and say that the level of aggregation may be too severe to capture the effects of imperfections. They also have doubts about the actual division done by Harberger. Using his own data and methodology, alternative aggregations of 'heavily-taxed' and 'lightly-taxed' sectors can be obtained, which are likely to yield different results.

(c) Harberger's implied methodology of analysing one distortion at a time can be misleading, because the effect of

⁵¹ Melvyn Krauss, "Differential Tax Incidence: Large versus Small Tax Changes," Journal of Political Economy, Vol. 80, January-February 1972, pp. 193-197.

⁵² Op.cit.

two simultaneous distortions need not even be approximately equal to the sum of their individual effects.

(d) Ratti and Shome have tested the model-specificity of the Harberger results by including land as a factor of production in the non-corporate sector.⁵³ Their results show that capital does not bear the full burden of the tax, as Harberger concluded. Thus, even this model is not free from the volatility of the results observed in econometric studies.

(e) As mentioned earlier, various assumptions made by Harberger have been questioned and it has been occasionally demonstrated that the results may change if these assumptions are changed.

- (i) His assumption of fixed supply of factors is considered too unrealistic for an empirical estimate, which has to be in a dynamic setting.
- (ii) His assumption of perfect mobility has also been questioned. McLure and Thirsk show that the results will be different if this assumption is dropped.⁵⁴
- (iii) An implied assumption in Harberger analysis is that the tax will make no difference to the debt-equity ratios or the industrial division between corporate and non-corporate sectors

⁵³ R.A. Ratti and Shome Parthasarathy, "The Incidence of the Corporation Income Tax: A Long-Run, Specific Factor Model," Southern Economic Journal, Vol. 44, July 1977, pp.85-98.

⁵⁴ Charles E. McLure, Jr. and Wayne Thirsk, "A Simplified Exposition of the Harberger Model," National Tax Journal, Vol. 28, March 1975, pp. 1-28.

(except adjustments in use of factors of production). This is open to question.

- (iv) The assumption of constant elasticity of substitution actually makes the Harberger model determinate. This may be a valid assumption, but if we try to generalize to variable elasticities of substitution, as Roskamp shows,⁵⁵ the analysis becomes indeterminate.

To sum up, "The Harberger model is a simple, yet elegant description of the economy of neoclassical economics. And to the extent the real world resembles the world of the neoclassical economist, the model is a useful guide to policy. But the world clearly contains a great many non-neoclassical elements. ... This is not to say that the model is not an extremely useful analytical tool. It is to say that the model almost certainly does not describe the world exactly and that we can only err by assuming blindly that it does."⁵⁶

Subsequently, there have been a number of extensions of the Harberger model. He himself had tried to extend it to take into account the presence of monopoly. Anderson and Ballentine, however, did not think the method was correct, and did it a little differently.⁵⁷ They, however, confirm the original results of Harberger.

55 Karl W. Roskamp, "Production Functions and the Determinateness of Harberger's Analysis of the Incidence of the Corporation Income Tax," Public Finance, Vol. 32, No. 3, 1977, pp. 343-347.

56 Charles E. McLure, Jr., "General Equilibrium Incidence Analysis: The Harberger Model After Ten Years," Journal of Public Economics, Vol. 4, 1975, p. 159.

57 Robert Anderson and J. Gregory Ballentine, "The Incidence and Excess Burden of a Profit Tax under Imperfect Competition," Public Finance, Vol. 31, No. 2, 1976.

Ballentine took into account non-profit maximizing behaviour,⁵⁸ and concluded that results may differ from Harberger ones, depending on the parameter values.

McLure extended the Harberger model to consider labour as immobile,⁵⁹ but the conclusion of Harberger remained valid.

Vandendorpe and Friedlaender consider the presence of initial distortions.⁶⁰ They, however, do not include an empirical estimate of incidence in their analysis, as their analysis is general and theoretical.

Finally, Ballentine extends the Harberger model into a dynamic setting by relaxing the assumption of fixity of factors.⁶¹ He tries to get some estimates of long run shifting, but it proves to be very sensitive to assumptions about parameter values.

To sum up, a number of empirical studies have appeared since Coates presented his analysis way back in the twenties. But a universally accepted conclusion is still to be reached.

58 J. Gregory Ballentine, "Non-Profit Maximizing Behaviour and the Short-Run Incidence of the Corporation Income Tax," Journal of Political Economy, Vol. 7, 1977, pp. 135-146.

59 Charles E. McLure, Jr., "A Diagrammatic Exposition of the Harberger Model with One Immobile Factor," Journal of Political Economy, Vol. 82, January-February 1974, pp. 56-82.

60 Adolf L. Vandendorpe and Ann F. Friedlaender, "Differential Incidence in the Presence of Initial Distorting Taxes," Journal of Public Economics, Vol. 6, October 1976, pp. 205-229.

61 J. Gregory Ballentine, "The Incidence of a Corporation Income Tax in a Growing Economy," Journal of Political Economy, Vol. 86, October 1978, pp. 863-875.

The shifting and incidence of the tax remains an enigma, leaving scope for further research in this field.

3.1.6 Other Shifting and Incidence Studies on Corporate Income Tax

There have been two other streams of incidence studies of the tax under consideration over which, however, not much time will be spent here.

The first is the kind of studies which are generally in the general equilibrium framework, but different in that they incorporate uncertainty. These have been only theoretical so far. One or both the sectors are assumed to make their decisions under uncertainty, with probabilities to guide them. This type of analysis, however, has drawn very little attention for the reason that they are not very useful in answering the incidence question categorically and empirically.

The second stream is slowly catching up. Krzysaniak can be called the pioneer in this line of research.⁶² He tries to find out the dynamic incidence of the corporation income tax by incorporating the effect of the tax in a neoclassical growth model. Since then, quite a few studies on similar lines have appeared. But even these are yet to attract as much attention as econometric and general equilibrium studies did, because of their failure to give an answer to the incidence question for a not-too-long period. As Break puts it, "While dynamic

⁶² Marian Krzysaniak, "Effects of Profits Taxes: Deduced from Neoclassical Growth Models," in Krzysaniak (ed.), Effects of Corporation Income Tax, op.cit.

incidence models appear to be as hyperoptic as static studies are myopic, growth modelling will undoubtedly continue to play an important role in the incidence analysis".⁶³

3.2 Empirical Studies in India

Empirical studies on shifting and incidence of corporation income tax in India have more or less followed the evolution of methodology on the same topic in U.S. We discuss the studies in chronological order below.

3.2.1 Ambirajan's Study

The first comprehensive work on corporation income tax was by Ambirajan,⁶⁴ who considered the question of shifting among other things.

His approach is to first ascertain the avenues of shifting. These he decides to be through price increases (forward shifting), through reduction in wages (backward shifting), and, curiously, through reduction in dividend payout (on to the stock holders). The last seems strange, because the stockholders are owners of the corporation, after all, and if their income is reduced, it cannot be called shifting. Anyway, going by Ambirajan's method, the tax is shifted only to the extent that it does not reduce retained earnings.

⁶³ George F. Break, "The Incidence and Economic Effects of Taxation," in Alan S. Blinder et al, The Economics of Public Finance, Brookings Institution, Washington D.C., 1974, p. 136.

⁶⁴ S. Ambirajan, The Taxation of Corporate Income in India, Asia Publishing House, Bombay, 1964, especially pp. 220-240.

To examine the possibility of backward shifting, he looks into the average earnings of factory labour in India from 1939 to 1959. By juxtaposing it against the tax rate, he finds that they have been increasing side by side which according to Ambirajan would seem to throw doubts on the validity of the backward shifting hypothesis. There is even no a priori case for it, as Ambirajan thinks, because of trade union pressures and governmental regulations regarding minimum wages, bonus, etc. The rise in wages, according to him, are due to the combined effect of price rise, trade union pressures and the "spite effect" of the taxes, particularly excess profits tax (the businessman preferring to give the money away to labour rather than the tax-collectors). However, Ambirajan has missed an important point. It is possible that wages might have been still higher but for the corporation income tax. If this is true, then the tax had been shifted backwards. But there is no way to test this hypothesis with Ambirajan's methodology.

As for forward shifting, all Ambirajan is willing to say is "that the taxes might have been partially shifted during the boom period between 1939 and 1951, but might not have been shifted during the period after 1951".⁶⁵ He analyses the two sub-periods separately. For the first period, the correlation coefficient of wholesale price index for manufactured goods and tax rate is as high as 0.7756. But Ambirajan does not come to any conclusion based on this only. He agrees that there was

65 Ibid., p. 224.

ample opportunity to shift with great increase in effective demand over the first period due to the Second World War and its lagged effects (explosion of demand after the withdrawal of wartime controls), and relative deficiency in supply. Moreover, the actual price level must have been still higher as official figures do not take into account widespread black marketing. But labour costs as well as raw material costs also went up by leaps and bounds. "In such a situation, how can we categorically say that taxes only, taxes alone, have caused the high prices?"⁶⁶

In the second period, the correlation coefficient between the same two variables is as low as 0.172: there was very little scope for shifting. Prices were steady, and though profits and taxes went up together, the rise in profits can be ascribed to increased production. It was no more a sellers' market but a buyers' one by this time, and it would have been difficult to shift the tax forward. Therefore Ambirajan concludes that the taxes were not shifted forward to any appreciable extent during the period 1951-59.

As for the other possibility of shifting on to the stockholders,⁶⁷ Ambirajan examines the division of profits

66 Ibid., p. 227.

67 Strictly speaking, it cannot be called shifting at all whether the tax reduces dividends directly, or the retained earnings, which would reduce future growth and profits and hence the present market value of the shares, matters little. Ultimately, it is the stockholder who has to bear the burden of the tax.

before tax into taxes, dividends, and retained earnings to ascertain it. He finds that taxes have increased at a greater rate than profits, the brunt of it borne mainly by dividends, as retained earnings have increased at about the same rate as profits. This is true, however, for the first period (1939-51). During the second period (1951-59) it was exactly the opposite. Dividends had reached their rock-bottom and could not be slashed further for fear of the shares losing their value in the stock-market. So dividend rate was fairly constant and any increase in the tax burden fell on the retained earnings. Thus, the tax was shifted to some extent on to the stock holders before 1951, but after that it was borne by the companies themselves.

Thus, in all, Ambirajan's conclusion seems to be that prior to 1951, the tax was shifted forward as well as on to the stockholders to some extent, but after that, it was borne by the companies themselves.

The main defect of the whole analysis seems to be Ambirajan's unwillingness to commit himself to any conclusion. One is aware, of course, that the limitations of his methodology do not allow him to make categorical statements, and Ambirajan does recognize this. As it has been pointed out many times already, to give a specific answer to the shifting question, one has to sort out the tax effect from the other effects on the relevant variables. Ambirajan was not able to do this (though he did attempt a non-rigorous analysis), and hence has to be content/^{with}tentative conclusions only.

3.2.2 The Study by Lall

Methodologically, Lall's study is not very different from the one discussed above.⁶⁸ However, there are important differences. The similarity lies in the fact that both of them examine the trend in the tax rate and the other variables where shifting should show up to arrive at a conclusion about shifting. But the latter group of variables is different. Whereas Ambirajan used variables which relate to the whole economy (e.g., wholesale price index, wages), Lall concentrates on balance-sheet and profit-and-loss account data, confining himself to the corporate sector only. To that extent, it is an improvement over the earlier study.

The data used by Lall are those from his own sample, the Taxation Enquiry Commission (TEC) sample, and the Reserve Bank of India (RBI) sample. He prepared shifting indices from the income and appropriation accounts as well as the balance sheets for profits, materials costs, and wages and salaries. Forward shifting was taken to be the residual of the tax burden after the extent of the tax burden shifted backwards and borne by the company itself were ascertained. Also, he did not distinguish between the company and shareholders as far as shifting was considered, though he did examine which part of net profits gets reduced, when the companies are unable to shift the tax.

Lall's own sample is for the period 1956-65. He extends

⁶⁸ V.D. Lall, "Shifting of Tax by Companies," Economic and Political Weekly, Vol. 2, May 6, 1967, pp. 839-849.

it back to 1951 with the help of the RBI sample and further back to 1946 taking TEC figures. Although the sample sizes are different, it is possible to do this, because Lall works with ratios only.

Lall considered profitability ratios for both equity base (taking profits before/after tax) and total base (taking profits before/after tax plus interest payments). Profits as ratios of net worth (rate of return on equity), sales (profit margin), and capital employed (rate of return on total capital) were considered. Tax increase is fully shifted when profitability before tax increases in such a way that profitability after tax remains the same. It is not shifted at all when profitability before tax does not change in any way as a consequence of the tax.

Lall uses five-year averages as he believes them to be more stable. For 1956-60 to 1961-65 period, he finds that the tax was more than fully shifted as profitability (taking any one the profitability ratios) increased more than the tax rate. This had occurred despite a fall in turnover of capital during this period. This indicates more than full shifting.

Considering factor shares, share of profits in the value of production as well as in value added rose. However, share of materials and labour fell by a small amount, indicating some backward shifting.

Lall postulates a somewhat peculiar profit function

$$R/W = f(F/W) (V/F) (P/V) \pi . \quad \dots(3.39)$$

where R = profits after tax plus depreciation, W = net worth plus depreciation reserve, F = gross fixed assets, V = gross value added, P = profits before tax plus depreciation, and $\tau = 1 - \text{tax rate}$. Tax rate is defined as the effective tax rate (TP/PBT), TP being tax provision and PBT being profits before tax.

Taking pairs of figures (five-year averages) for two periods and allowing one of the independent variables to change according to the actual figure for the second period, and keeping others constant at the initial value, Lall tries to find out the individual impact of all these variables on profitability. Here, however, he finds a negative impact of tax increases on profits which is considerable. Taking the various values net of depreciation also gives the same answer.

All these results were based on Lall's own sample data. The RBI sample data broadly confirms this. In it, the backward shifting is still more prominent. Taking RBI data for 1951-55 also yields the same conclusion.

The TEC data for 1946-50 as compared to 1961-65 data confirms the "ratchet effect" pointed out by K-M in their study. Effective tax rate came down, but the benefit was not shared with consumers or labour/materials suppliers. It went to swell the profits after tax.

With this analysis, Lall concluded that the tax increase is more than fully shifted (but not the tax decrease), partly to the factors of production and partly to the consumers. He

has extended⁶⁹ his analysis to the period 1966-70 and 1971-72. This has made him revise his conclusions slightly. The period 1966-70 was a recessionary period, and the tax was shifted to a much smaller extent during this period. So Lall concluded that in normal conditions the tax is fully shifted, either forward or backward, or both; but under recessionary conditions it was not shifted fully.

Lall's study is painstaking, but his methodology leaves a lot to be desired. His analysis does not even conform to his own definition of shifting. Initially, he defines shifting as increase in before-tax profitability due to the increase in tax rate. But in his actual analysis, he takes any change in profitability concurrent with a change in the tax rate as shifting, irrespective of whether it was actually due to the change in tax rate or not. At many places, he himself says that the increase in profitability was probably due to certain factors other than the tax rate. But since profitability and tax rate both went up together, it is taken as shifting aided by the other factors. This contradicts his own definition, because the definition implies the ceteris paribus effect of the tax rate on profitability.

If he tries to isolate tax effect anywhere, it is while estimating change in profitability with the help his multiplicative identity (which he calls a function). He estimates

69 V.D. Lall, "Corporate Taxation," Economic Times (Annual), 1974, pp. 112-127.

percentage change in profitability due to those factors individually and sums them up to find the combined effect. In that exercise, he estimates the tax effects on profitability, keeping other things constant.

This is obviously incorrect, because this is permissible only when the other variables on the right hand side are independent of the tax rate which is not the case. However, overlooking this for the moment, the estimated tax effects on profits after tax are to the tune of -0.49 per cent between 1959-60 and 1961-65, -0.37 per cent between 1956-60 and 1966-70, and -0.06 per cent between 1961-65 and 1966-70. Even with these calculations it is not possible to say anything about the degree of shifting unless the above figures are considered in relation to the changes in tax rate for the same periods. And if these figures are taken as indicators of the degree of shifting (which is incorrect), they do not support Lall's conclusion of no shifting between 1965 and 1970 as profits after tax is hardly affected. Thus, not only the method itself, but also the interpretations are incorrect.

Lall's study has been criticised by Gandhi on his methodological lapse.⁷⁰ Gandhi suggested multiple regression as a better method of isolating the tax effect. Lall's reaction is worth quoting: "Multiple regressions and other econometric methods might be aesthetically more satisfying, and, if Gandhi

⁷⁰ Ved P. Gandhi, "Comment," Economic and Political Weekly, Vol. 2, June 17, 1967, pp. 1089-1091.

so chooses he is welcome to use them, but I doubt if he would thereby come to significantly different conclusions. In any event, econometric treatment is not mandatory just because some recent American studies have used this method."⁷¹ The "recent American studies" is a reference primarily to the K-M study. The point is, however, that whether a methodology is liable to give wrong answers because of inherent incorrectness. An incorrect methodology, even if it manages to give correct answers, cannot be accepted, because the correct answers are then simply accidents. It is more than likely that it would give incorrect answers.

3.2.3 Application of K-M Model to India

The application of econometric analysis to Indian data started with the use of the K-M model, almost as it was, by Laumas, to resolve the same question with reference to India.⁷²

The equation estimated was

$$Y_t^E = a_0 + a_1 \Delta C_t + a_2 V_{t-1} + a_3 J_t + a_4 G_t + a_5 L_t + U_t \quad \dots (3.40)$$

It may be recalled that K-M used ΔC_{t-1} (lagged consumption variable) instead of ΔC_t and dropped G_t (representing government expenditures) in their preferred equation. As for substituting ΔC_{t-1} by ΔC_t , Laumas does not provide any

71 V.D. Lall, "Reply," Economic and Political Weekly, Vol. 2, June 17, 1967, p. 1093.

72 G.S. Laumas, "The Shifting of the Corporation Income Tax—A Study With Reference to Indian Corporations," Public Finance, Vol. 21, No. 4, 1966, pp. 462-471.

explanation, but a priori, it seems that ΔC_t is the more relevant variable. As for G_t , presumably it is present because it proved to be statistically significant, unlike in the K-M study. Like K-M, he uses instrumental variable technique, using Z_t^* (effective tax rate) and Z_t (statutory tax rate) as instruments.

The data used by Laumas were those published by RBI for sample companies (medium and large, non-government, non-financial) for the years 1950-51 to 1961-62, along with data from Estimates of National Income.

In his estimation, ΔC_t proved to be insignificant and it was dropped. The preferred equations for gross rates of return, equity base and total base, are:

$$Y_t^E = .0805 - 0.2325 V_{t-1} + 1.1601 J_t - 0.4447 G_t + 1.1353 L_t, \quad (3.41)$$

(-1.5894) (3.3660) (-2.4188) (2.7869)

$$\text{and } Y_t^G = .0535 - 0.1817 V_{t-1} + 1.0925 J_t - 0.5094 G_t + 1.7657 L_t. \quad (3.42)$$

(-1.3761) (3.5136) (-3.0692) (4.7454)

Obviously, the results denote more than full shifting, just like the K-M study. However, unlike the K-M study, Laumas gets a negative significant coefficient for G_t and a positive (negative in K-M study) significant coefficient for J_t . He makes an attempt to explain them also.

G_t , representing government expenditures would normally be expected to have a positive coefficient in explaining profit rates in the private sector. Laumas explains the curious sign in the special context of a developing country like India.

According to him, this is because the government becomes a competitor to the private corporate sector in the factor market in the short run, in its effort to provide the necessary social overheads which benefit the private sector after a long gestation lag. Thus, in the short run, factor costs are pushed up due to public expenditures. Moreover, the government with the vast resources behind it, generally takes away the more efficient factors of production which also obliges the private sector to use the less efficient ones. Thus, the short run effects of public expenditures are negative though the long-run effects may as well be positive.

As for the positive coefficient for J_t , representing taxes other than corporate income tax, the explanation offered is that though the government tried to contain inflation by levying higher indirect taxes, the pressure of demand kept rate of return rising. If this is true, it is strange that the consumption variable, representing demand, should be insignificant. In any case, if demand pressure masks the true negative coefficient of J_t , the equation obviously has an omitted variable, one representing demand effectively.

Laumas applied the same specification to eleven disaggregated industry groups also.⁷³ The point estimates range from 0.8307 (electrical machinery, appliances, etc.) to 2.5778 (cotton textiles), most of them exhibiting more than full shifting.

⁷³ G.S. Laumas, "The Shifting of the Corporation Tax in India," Economia Internazionale, Vol. 22, No. 2, 1969, pp.283-290.

Laumas has been criticised on three counts, beside his estimation being open to all the criticisms against the K-M study.

First, he has been criticised for using a specification meant to explain rate of return in the U.S. to a country like India.⁷⁴ However, unless the critics somehow show the specification to be inapplicable, it is futile to criticise Laumas on this score.

The other two criticisms/shortcomings are more serious, both pointed out by Rao.⁷⁵ The first is with regard to the high one-to-one correlation between G_t and J_t , creating a very substantial multicollinearity problem. Laumas has not even checked for it. The results, therefore, are suspect. The second important defect is that of improper instrument. For K-M, Z_t was an obvious instrument which fulfilled the properties of a good instrument (high correlation with the original independent variable, vis. L_t). But for Laumas, neither Z_t , nor Z_t^* fulfil this condition. Thus, the instrument used does not seem proper.

The alternative suggested by Rao, however, is OLS estimation, which Laumas has undertaken anyway. The results arrived at through OLS are not very different. This implies that it is

74 Ved P. Gandhi, "The Incidence of Company Tax: Suggested Hypotheses," Artha Vijnana, Vol. 10, March 1968, pp. 11-28.

75 V.G. Rao, The Corporation Income Tax in India, Concept, New Delhi, 1980, pp. 93-94 and 114-115.

not the estimation method which causes the results to be what they are, but the specification itself. This is conclusively proved later by Mehta and Menaria,⁷⁶ undertaking an evaluation of the various specifications. They show that the same specification performs comparatively badly for a more recent set of data, implying that the coefficients calculated by Laumas are not stable. Our experiments with the Laumas equation reported later in Chapter 4 also confirm this point.

3.2.4 The Gandhi Contribution

Ved P. Gandhi, whose suggestion of using multiple regressions was not favourably received by Lall, used it himself later in two papers on shifting of the corporate income tax, one aggregative⁷⁷ and the other disaggregative.⁷⁸

The aggregative study uses the same kind of data used by Laumas for almost the same period. But besides having a different specification for the rate of return, Gandhi estimates four more equations to find out the party bearing the burden of the tax. The sets of equations as estimated are:

76 B.C. Mehta and Rajendra Menaria, "Short-Run Incidence of Corporate Income Tax in India," Indian Economic Journal, Vol. 26, July-September 1978 (Conference Number), pp. 64-83.

77 Ved P. Gandhi, "The Incidence of Company Tax: Suggested Hypotheses," op.cit.

78 Ved P. Gandhi, "Company Tax Incidence—Industry Studies," Indian Economic Review (New Series), Vol. 3, April 1968, pp. 33-47.

$$\begin{aligned} (\text{PAT}/\text{NW}) &= 0.29 - 0.36^*(\text{T}/\text{PBT}) + 0.10^*(\text{S}/\text{KE}) + 0.44^*(\text{I}/\text{Y}) \\ &\quad - 0.1(\text{INV}/\text{S}) + 0.01^*(\text{Y}/\text{P}) \quad \dots(3.43) \end{aligned}$$

$$\begin{aligned} (\text{D}/\text{Km}) &= 6.70 - 0.38^*(\text{T}/\text{PBT}) + 0.17^*(\text{PAT}/\text{NW}) \\ &\quad + 0.87^*(\text{D}/\text{K})_{t-1} \quad \dots(3.44) \end{aligned}$$

$$\begin{aligned} (\text{RE}/\text{PAT}) &= 9.94 - 0.01(\text{T}/\text{PBT}) + 0.04(\text{S}/\text{KE}) \\ &\quad + 0.01(\text{I}/\text{Y}) - 1.11^*(\text{Y}/\text{P}), \quad \dots(3.45) \end{aligned}$$

$$\begin{aligned} (\text{WS}/\text{V}) &= 76.0 + 0.43^*(\text{T}/\text{PBT}) + 0.36^*(\text{S}/\text{KE}) \\ &\quad - 0.04(\text{P}_t/\text{P}_{t-1}) - 0.95^*(\text{I}/\text{Y}), \quad \dots(3.46) \end{aligned}$$

$$(\text{GP}/\text{KE}) = 8.36 - 0.23^*(\text{T}/\text{PBT}) + 0.08^*(\text{S}/\text{KE}) + 0.23^*(\text{I}/\text{Y}). \quad \dots(3.47)$$

* Significant.

The notations are as follows: PAT = Profits after tax, NW = Net worth, T = Tax Provision, PBT = Profits before tax, S = Sales, KE = Capital employed, I = Investment, Y = National Income, INV = Inventory, P = Population, D = Dividends, Km = market value of paid-up capital, RE = Retained earnings, WS = Wages and salaries, V = Value added, P = Wholesale price index for manufactured goods, and GP = Gross profits.

The rate of return is obviously net of tax. This means that an insignificant coefficient for the tax rate variable would imply full shifting. Otherwise, the expected sign of the coefficient is negative in all the equations.

It is actually so in all the equations except that for (WS/V) showing negative backward shifting, i.e., rise in wages with rise in tax rate.

Gandhi has not given a measure for shifting, except noting for each equation, whether the coefficient for the tax rate is significant or not. In the (PAT/NW) equation it is negative and significant, implying that a portion of the tax was borne by the company. Since the tax rate coefficient in (D/Km) equation is significant and negative, but not significant in the (RE/PAT) equation, it means the tax reduced dividends but not retained earnings.⁷⁹ The positive coefficient in the (WS/V) equation probably shows tax avoidance through increased expenditures on wages and salaries.

However, some of the results, and Gandhi's interpretations seem to be doubtful. The (RE/PAT) equation has only one significant coefficient, that for the per capita income. Since the connection is very tenuous, the equation is of doubtful validity. Gandhi concludes that "the company tax in the past has been partially shifted to the Government, and partially it has been borne by the stockholders. It has not affected the retentions of the companies significantly. It has neither been shifted forward to consumers nor backward to labour".⁸⁰ The conclusion contains two errors. First, shifting to the Government (which should properly be called tax avoidance), on the evidence of a negative significant coefficient for the tax rate in the (OP/KE) equation, is only notional in the sense that it reduces the tax

79 This, in fact, conflicts with Ambirajan's findings.

80 Ved P. Gandhi, "The Incidence of Company Tax: Suggested Hypotheses," op.cit., p. 24.

burden whereas actual shifting is with reference to a given tax burden, and cannot account for a part of actual shifting. Second, since Gandhi does not have a measure for the degree of shifting he cannot be certain that there has been no forward shifting. Taking the coefficient of the tax rate in the (PAT/NW) equation as a rough indicator of the degree of shifting, it shows that about 60 per cent of the tax burden is shifted. Since there is no backward shifting, some forward shifting has to be present. But Gandhi concludes that there has been no forward shifting.

The industrywise study is not very different from the aggregative one, except for differences in the specifications. The estimated equations are as follows:

$$(PAT/NW) = f(T/PBT), (S/KE), (S/CGS), (NW/KE) \quad \dots(3.48)$$

$$(D/K) = f(T/PBT), (S/KE), (K/NW), (D/K)_{t-1} \quad \dots(3.49)$$

$$(RE/PBT) = f(T/PBT), (S/KE), (D/K), (d/GFA) \quad \dots(3.50)$$

$$(WS/V) = f(T/PBT), (S/KE), (C_t/C_{t-1}), (GFA/GTA) \quad \dots(3.51)$$

$$(GP/KE) = f(T/PBT), (S/GFA), (GFA/GTA) \quad \dots(3.52)$$

The new variables are: CGS = cost of goods sold, K = book-value of paid-up capital, d = depreciation reserves, GFA = gross fixed assets, and GTA = gross total assets.

The industries analysed were three - aluminium, electricity generation and supply, and matches.

Concentrating on the tax variable, in the aluminium industry it reduces profits after tax to a statistically

significant, but small, extent; small enough to suggest shifting. But neither wages nor profits before tax show any shifting. This creates an impossible situation which Gandhi does not realize at all. This is because he completely ignores the value that the tax rate coefficient takes. A coefficient of -0.0103 in the PAT/NW equation hardly indicates that there has been no shifting at all.

The situation is the same for matches industry, though slightly better because the tax rate coefficient in the (PAT/NW) equation is -0.2103 . In case of electricity generation and supply, one encounters another peculiar situation. The tax does not affect (PAT/NW) significantly, but it affects the retention ratio significantly. This is very difficult to visualize, because by the very nature of shifting process and by definition $(PAT = D + RE)$,^{and} any effect of the tax rate on RE must be through PAT .

Gandhi's analysis, as our brief discussion shows, thus suffers from certain inconsistencies which have been completely overlooked by him. The main reason seems to be that he does not attach any importance to the extent of shifting. If he had a measure of shifting, the inconsistencies would have been immediately apparent. The attempt to decompose shifting into backward and forward needs special mention because it was the first attempt in that direction. However, what he actually calculates are the total degree of shifting and backward shifting (PAT/NW and WS/V equations). The other equations estimated are of less direct relevance.

3.2.5 The Mathew Study

This study is similar to Gandhi's in the sense that, like Gandhi, Mathew estimates a set of equations, not one.⁸¹ Like Gandhi again he considers the distinction between the stockholders and the company to be relevant for shifting analysis. The variables examined are (PAT/TA), (WS/NS), (DIV/NS), and (RP/NS), where PAT and WS are familiar terms. TA denotes total assets, NS denotes net sales, DIV stands for dividends, and RP stands for retained profits.

Four industries were examined—cement (3 companies), pharmaceuticals (10 companies), cotton textiles (37 companies) and jute textiles (10 companies). The number of companies, within parentheses gives the number of sample companies, the sampling being done by Mathew himself. He collects data for these companies for nine years (1959-67), and pools the cross-section and the time series data.

The equations estimated are:

$$\begin{aligned} (\text{PAT/TA}) = a_0 + a_1(\text{T/PBT}) + a_2(\text{NS/TA}) + a_3(\text{INV/WC}) \\ + a_4(\text{NS/CGS}) + a_5(\text{NW/TA}), \end{aligned} \quad \dots(3.53)$$

$$(\text{WS/NS}) = a_0 + a_1(\text{NS/TA}) + a_2(\text{FA/WS}) + a_3(\text{T/PBT}), \quad \dots(3.54)$$

$$\begin{aligned} (\text{DIV/NS}) = a_0 + a_1(\text{NS/TA}) + a_2(\text{DIV/PBT}) + a_3(\text{DEP/FA}) \\ + a_4(\text{PBT/TA}) + a_5(\text{T/PBT}), \end{aligned} \quad \dots(3.55)$$

⁸¹ Balbir S. Sahni and T. Mathew, The Shifting and Incidence of the Corporation Income Tax, Rotterdam University Press, 1976, contains the only published account of this study (pp. 131-141).

$$\begin{aligned}
 (RP/NS) = & a_0 + a_1(NS/TA) + a_2(DIV/PBT) + a_3(DIV/SC) \\
 & + a_4(DEP/FA) + a_5(TA/TA_{t-1}) + a_6(T/PBT). \quad \dots(3.56)
 \end{aligned}$$

The new terms are: TA = Total assets, NS = Net sales, WC = Working capital, FA = Fixed assets, DEP = Depreciation, RP = Retained profits, and SC = Share capital. The equations were also estimated with year or company dummies, or both.

The results for the first equation showed the coefficients of the tax rate to be 0.0847, 0.0532, -0.0053 and 0.0076 for cement, pharmaceuticals, cotton textiles and jute textiles, of which the last two are insignificant statistically.

From this, Mathew concludes that forward shifting is present in a small degree in cement and pharmaceuticals, whereas the other two do not shift the tax. First of all, the conclusions are grossly incorrect. If Mathew's dependent variable was profits before tax, his interpretation would be correct; but he uses profits after tax, which means cotton and jute textiles shift the tax fully, whereas the other two shift more than fully. Moreover, when profits are taken as the index of shifting, it shows total shifting, not only forward shifting. Thus, there are serious errors in Mathew's interpretation.

The WS/NS equation shows negative tax rate coefficient for all four industries, but only two are significant - those for pharmaceuticals and cement. Mathew draws the correct conclusion that there are attempts at backward shifting in all four industries (going by the sign of the coefficients), but successful only in the above-mentioned two.

The dividend equation is also misleading. Only cotton textiles industry has a significant negative coefficient. Other tax rate coefficients are positive, but insignificant. Mathew deduces from this that the tax is shifted to stockholders only in cotton textiles. Apart from the point that "shifting to stockholders" is conceptually of little use, there is an identity involved in the specification. The product of two explanatory variables - (DIV/PBT) and (PBT/TA) - and the inverse of another (NS/TA) is identically equal to the dependent variable (DIV/NS) . As such, a logarithmic equation would have clearly shown it. Since the form is linear, the coefficients do not show up the identity. But all the same, the equations, particularly the coefficients of (T/PBT) can hardly be depended upon.

The performance of the retained profits equation is not very good, judging by the explanatory power, except in cement industry. The effect of the tax on retained profits, however, is not significant, except in the case of cotton textiles. Curiously, in this case, it is positive, which is difficult to rationalize unless there has been more than 100 per cent shifting. But the first equation does not show more than full shifting in this industry.

It may be noted that the most important equation, that for (PAT/TA) is almost the same as that used by Gandhi, with minor differences and one added variable (INV/WC) , which turns out to be insignificant in all cases anyway. (NS/TA) , (NS/CGS) and (NW/TA) are almost exactly the same as (S/KE) , (S/CGS) and

(NW/KE) respectively, the latter three referring to Gandhi's explanatory variables. Thus, the study does not offer anything new in terms of methodology or specifications. The results are open to doubt, and the sample sizes are too small to deduce anything about the respective industries.

3.2.6 The Contribution of Rao

Rao's complete study⁸² was preceded by the publication of the results for his aggregated study,⁸³ which forms part of his whole study. The other part consists of his results for the disaggregative analysis for 23 industries.

His aggregative study uses the K-M formulation of the problem and definition of shifting as well as the measure of shifting. He differs from the K-M study on two counts: the specification and the estimation technique.

The tax rates used (L_t and Z_t) are lagged one year rather than current, on the belief that it takes a year for the tax effect on the profits to show. As a consequence, the tax variable is independent of the error term (unlike in the K-M analysis), and OLS can be used.

The equation estimated for the aggregative analysis was

$$Y_t^E = a_0 + a_1 I_t + a_2 V_t + a_3 C_t + a_4 L_{t-1} + U_t \quad \dots(3.57)$$

82 V.G. Rao, op.cit.

83 K.S.R.H. Rao and V.G. Rao, "The Incidence of the Corporation Income Tax in the Short Run: The Case of Indian Corporations," Public Finance, Vol. 26, No. 4, 1971, pp. 586-606.

Following K-M, this equation was called Model A. Z_{t-1} was substituted for L_{t-1} in model B. All the notations are familiar except I_t , which stands for investment-national income ratio. C_t stands for (cost of production/value of production) in this formulation.

The results rejected the full shifting hypothesis, and strongly supported the zero shifting hypothesis, taking all the alternative estimations (with equity base or total base, and including or excluding depreciation) into account.

For the disaggregated analysis, the variable I_t was substituted by P_t (S/KE, that is, turnover ratio) as an explanatory variable.

The results, as can be expected, show widely divergent degrees of shifting - from significant negative shifting to more than hundred per cent. But more often than not, zero shifting was indicated.

Thus, Rao comes to the conclusion that "the traditional zero-shifting hypothesis comes close to reality in majority of the Indian industries".⁸⁴

Rao's work is a painstaking piece of research, with a lot of attention given to econometric details. Given his specification, the estimates cannot be faulted. But the crucial variable, the tax rate, without precedent, is lagged one year. This is something which seems arbitrary as no reason is advanced.

84 V.G. Rao, op.cit., p. 206.

A proper method would have been to either alternatively use the current and lagged values, or use them together, and then use the more relevant one determined empirically. But this has not been done.

The second probable error is in using investment as an explanatory variable. Investments themselves are certainly influenced by the effective tax rate through the various capital consumption allowances and investment incentives given. We know this a priori, and this should make one refrain from using investment as an explanatory variable along with effective tax rate.

A comparison of Rao's estimation with those done by Gandhi, for individual industries, is revealing. The specifications of the two studies do not differ much. Gandhi uses capital structure (NW/KE), which is substituted by V_t (Inventory-sales ratio) in the Rao study. This is the only major difference. A minor difference is that Rao uses (CP/VP) instead of (CGS/S) used by Gandhi. These are, of course, besides the substitution of the current value of the tax rate by the lagged value.

But the results are quite different, accepting the interpretations of the respective authors. Gandhi believes that electricity generation and supply industry at least partially shifts the tax, but matches and aluminium industries do not. Rao finds zero shifting in all the three industries. However, as we have pointed out earlier, Gandhi's interpretations are a little shaky and vague. Taking the magnitude of his tax rate

coefficients into account, his conclusion regarding electricity industry is perhaps admissible, but the other two also exhibit at least substantial partial shifting. This would be quite contrary to Rao's conclusions.

3.2.7 The General Equilibrium Analysis

All the studies discussed so far applied either the analysis of broad co-variability of the tax rate and various shifting indices, or the econometric technique of multiple regression. Until recently, the methodology of general equilibrium analysis was not applied to India. Shome has recently carried out such a study.⁸⁵

The study is very much on the same lines as the original Harberger study. The major assumptions are retained. The only major change is the provision for a pre-existing tax, so that the analysis is in terms of marginal changes rather than the whole tax rate. Another difference—albeit a minor one—is that Shome dispenses with the use of V , the elasticity of product substitution. This he is able to do because he uses E_2 , price elasticity of demand for X_2 (product of the non-corporate sector) directly rather than an estimate of E_1 , derived from E_2 . This is done because empirical estimates for E_2 are easier to come by, according to Shome. Rest of the analysis follows the Harberger study, ultimately solving for the change in capital

⁸⁵ Parthasarathy Shome, "The Incidence of the Corporation Income Tax in India: A General Equilibrium Analysis," Oxford Economic Papers, Vol. 30, March 1978, pp. 64-73.

rental (relative to labour, since wage rate is the numeraire) in terms of various parameters. These parameters are factor shares in the sectoral income, sectorwise share of each factor in one sector in the total factor share, elasticities of factor substitution and change in the tax rate.

The estimates for these parameters are again on the same lines as Harberger. First, sectorwise capital income assessed, and tax data are taken from All-India Income Tax Statistics. Any sector paying a tax of 20 per cent or more of its income is included in the corporate sector. For the agricultural sector, the capital income was calculated by assuming that the capital income was either 10 per cent or 20 per cent of Net Domestic Product originating in that sector. Accordingly, the tax-capital income ratios were calculated. Labour incomes (non-capital, strictly speaking) were calculated by deducting capital incomes from the NDP generated by the respective sectors.

Elasticities of substitution were assumed to be unity and 1.5 for the corporate and non-corporate sector respectively, on the basis of empirical studies in the U.S. Expecting comments on this score, Shome expressed his belief that it will not be any less in India, given high capital costs. If it is higher, the conclusions are further substantiated. Finally, he assumes the demand in non-corporate sector to be relatively inelastic, such that $E_2 = -(6/7)$, exactly as Harberger did.

Armed with these, Shome calculates the change in capital rental that would imply that the full burden is on capital, and

compares the calculated change with the actual. He concludes that though capital bears the larger share of the burden in the long run, labour also bears a part of it.

There is no new methodological comment to make on this study except to note that the generalization to marginal tax rate changes (the Harberger-type initial no-tax situation becoming a special case) is certainly praiseworthy.

As far as the actual empirical analysis is concerned, there is one important point to be noted. The capital income in agriculture, calculated in the same way as for other sectors, comes to Rs.4272.76 lakhs as against the tax amount of Rs.2245.56 lakhs for that sector. The ratio of tax to capital income is thus more than 0.5. But Shome does not think that the capital income figure shows the true picture, mainly because it is too small to be true. The reason obviously is that the majority of income-earners in this sector do not even file an income-tax return. So he takes two alternative estimates (10 per cent or 20 per cent of the NDP in this sector) of capital income. In the face of paucity of data, this is perhaps permissible. But what if the same considerations apply to some other sectors? So far as sector 1 (manufacturing, consumption, electricity, gas and water supply) is concerned, the possibility of such large-scale under-reporting of capital income is remote, since the bulk of it is in organized sector. A slight possible increase in the capital income will not alter things, since the tax percentage is much above (0.46) the dividing line (0.20) between the corporate and non-corporate sectors. But for the other two sectors which include

trading, transport and other services, and which are borderline cases (tax-capital income ratio of 0.19 for sector 2 and 0.20 for sector 3), this is important. In these cases, it is quite possible that a significant portion of capital income goes unreported. If this is so, and adjustment is made on the same lines as for the agricultural sector, one is no more sure of the correct place of these two sectors in the division between corporate and non-corporate. A further break-up of these sectors might help solve the problem, if subsectors clearly belong to corporate or non-corporate groups.

3.3 General Observations

This brief review of studies in corporation income tax shifting and incidence in India shows that the results, as in U.S., cover the whole possible range of shifting, and shifting of company tax in India is still a question to be settled. Individual studies may be commented upon as to their validity, but it does not provide the answer that we are seeking. However, certain issues emerge from this brief review.

The first, and most important, is that of a clear definition and a measure of shifting consistent with the definition. Many studies, as we noted, lack this, and interpretation of their results are a little vague for this reason. Broadly, there are two definitions of shifting being used, one with respect to the rate of return (or profit share) in the corporate sector only, and the other with respect to the same in the whole economy, the latter being used in the general equilibrium studies. Given the fact that corporate income tax is confined to the corporate sector

only, the first seems to be more relevant. Defining shifting in terms of wage-rental ratio also seems inferior because if both wages and gross profits are affected positively by the tax (as is indicated by the analysis of Sebold), it will under-state the degree of true shifting, which is with reference to profits only.

The other important issue is that of the method of calculating shifting. The first choice is between the general equilibrium method and econometric estimation. For a preliminary analysis, the latter seems to be preferable for two reasons. First, due to the nature of the process involved, the mechanism of general equilibrium adjustments take time to work out. The basis of the model is the tax-induced outflow of capital from the taxed sector. But this itself is dependent on the degree of immediate shifting. If immediate or short-run shifting is full, then the mechanism postulated is not activated at all. Thus, the first question to be settled is that of short-run shifting which can be estimated using econometric methods. Second, as it stands now, general equilibrium model for tax incidence analysis employs a definition of shifting which is less relevant. These considerations tilt the balance in favour of/in our case.

Even when one has decided to use econometric tools to estimate tax shifting, further choices have to be made. A single-equation estimation will be correct only when there is no simultaneity involved. If it is present, then one has to use the simultaneous-equations estimation.⁸⁶ But with increasing number

⁸⁶ The only important analysis of this kind, that by Sebold, *op.cit.*, appeared only recently. Therefore, we have not been able to assimilate it in our study.

of equations, the risk of misspecification increases. Thus, this is a question to be decided after one has specified his rate of return equation.

This is related to another question. A single-equation estimation may allow one to calculate total degree of shifting, but it does not say anything about the mechanism, or avenues, of shifting. Broadly the avenues are two, backward on to labour and forward on to consumers. The rate of return equation yields the total (or net) degree of shifting. To resolve the second part of the shifting question as to the avenues of shifting, Gandhi and Mathew estimated backward shifting, with an equation independent of the rate-of-return equation. But the performance of these equations are not very satisfactory, going by the explanatory power.⁸⁷ Obviously, some important explanatory variable is missing. It may be profits, in which case the system becomes a simultaneous-equation one. Or, it may be some physical variable like employment.

We confine the present study to calculation of short-run total degree of shifting only, recognizing the fact that this leaves the question of avenues of shifting unanswered. As will be discussed later, our estimation involved an iterative procedure which did not allow the exploration into other problem. Furthermore, combining iterative procedure with simultaneous equations would have complicated the estimation a great deal.

⁸⁷ Our experiments (not reported) with Gandhi's (WS/V) equation show that the explanatory power is even poorer than in the original study, for a more recent set of data.

CHAPTER 4

THE PRELIMINARY EMPIRICAL ANALYSIS

As the discussion in the preceding chapter showed, there is still no consensus among economists as to the shifting of corporation income tax.

Out of all the empirical studies on the shifting of the corporation income tax in India, only Shome's study can be called a medium-run one. Rest of them try to measure what is termed as short-run shifting only.

In the literature, shifting is conveniently divided into two types, the short-run shifting and the long-run shifting. The first measures the immediate (or, at the most, with a small lag) shifting through variables like price of the product and inputs whereas the latter measures shifting caused by changes in investment due to the tax. These two are definitely different mechanisms of distinct characters, identifiable theoretically; but in reality, the short run effects on prices are bound to be superimposed on the long-run investment effects, and vice versa. The investment decision cannot be independent of the price of the product and inputs. Similarly, disinvestment, or halting further investment which would have taken place in the absence of the tax, may start quickly enough and will naturally have its effect on product or input prices. Thus, though theoretically the distinction between short-run shifting and long-run shifting

seems to be sharp enough, in reality it is not.¹

In our subsequent analysis, we try to find out what is generally called short-run shifting. But this is done with the realization that it may contain elements of long run shifting too. The 'short-run' is used purely with reference to time and the underlying mechanism, it is recognized, need not necessarily be through the product and input prices only, though they may be of primary importance quantitatively. That, obviously, is because of the relative fixity of capital and the consequent difficulty in carrying out disinvestment (or even halting planned investment) decisions. The effect of short-run shifting on the long-run mechanism, we believe, is more important. Assuming investment decisions to be based on past and present rates of return, short-run shifting is bound to affect it through the rates of return to a great extent. Thus, short-run shifting is perhaps more important as a first step than long-run shifting and that is the reason we confine ourselves to short-run shifting.

Among the two approaches used to examine short-run shifting—correlation approach and the multiple regression approach—the latter is chosen for the reasons given in the preceding chapter while discussing Lall's analysis.

One of the common shortcomings in all the four studies on India using this approach, barring that of Rao to some extent,

¹ For a similar line of attack, criticising the assumption of constant capital over a one-year period, see J.M. Davis, "The Krzyzanick and Musgrave Model—Some Further Comments," *Kyklos*, Vol. 26, No. 2, 1973, pp. 387-388.

is the lack of sufficient number of observations. Gandhi's studies have only ten observations. Laumas uses eleven years' data while Rao uses data for fifteen years. As against this, the minimum number of independent variables in the various specifications used is four and the maximum number is six. The highest degrees of freedom, then, is only eleven. With such small samples, high explanatory powers of the various estimated regressions in terms of R^2 's may be suspect in the sense that the F-value may not be as high as one would be led to believe just looking at the R^2 's, i.e. the values of \bar{R}^2 's may be substantially less than the R^2 's. In any case, the stability of a particular regression can be best checked with additional data observations and re-computation of the same regression with the longer data set. This, then, constitutes our point of departure for the empirical analysis. However, before we undertake this, a brief outline of the model, which is essentially the same for all the studies discussed below, and some discussion about the data used will be in order.

4.1 The Model

The model outlined below is the same as set out in detail by K-M in their book. Since all the studies discussed below follow the same pattern with variations in estimation technique and/or the specification only, it would not be out of place to sketch the model here.

Representing the profit rate (to be exactly defined later) by Y and the various explanatory variables by x_1 's, the

basic equation can be written as:²

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \dots + U. \quad \dots (4.1)$$

The explanatory variables differ from author to author but the dependent variable is basically the same, and the explanatory variables contain at least one representing tax rate.

There are mainly three different definitions of profit rate used: the before-tax profit rate (profits before tax/net worth), the after-tax profit rate (profits after tax/net worth) and the gross profit rate (profits before tax including interest payments/capital employed). These three are called gross rate of return denoted by Y^G (equity base), net rate of return denoted by Y^N and gross rate of return denoted by Y^G (total base) respectively.³

Similarly, there are two tax rates used, the effective tax rate (tax provision/profits before tax) and tax liability rate (tax provision/net worth).⁴ These two tax rates are denoted by Z and L.

2 A legitimate question here would be why a linear equation should be assumed. Various economists have tried other forms like double-log or semi-log, but have found the linear format to be best. See, for example, Ved. P. Gandhi, "Incidence of Company Tax in India: Suggested Hypotheses," Artha Vinana, Vol. 10, No. 1, 1968, p. 21.

3 There are some other definitions of profit rate, but since these three definitions are used most often, it is better to concentrate on them.

4 In the U.S. studies, actual tax liability figure is used instead of tax provision figure.

Corresponding to the use of these two tax rates, there are two different shifting hypotheses: one, that the companies shift the whole of Z by raising Y^E (or keeping Y^N constant) and, two, that the companies shift the whole of L by raising Y^E (or keeping Y^N constant).

The equations related to these two hypotheses would then respectively be:

$$Y^E = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + \dots + a_nZ + U \quad \dots (4.2)$$

$$Y^E = c_0 + c_1x_1 + c_2x_2 + c_3x_3 + \dots + c_nL + V \quad \dots (4.3)$$

These two equations were called Model B and Model A respectively by K-M, and the same tradition has been followed by most of the subsequent authors using the same methodology. The dependent variable in (4.2) and (4.3) can be either Y^E (equity base) or Y^E (total base).

Alternatively, the dependent variable can be after-tax profit rate Y^N . The equations then would be:

$$Y^N = m_0 + m_1x_1 + m_2x_2 + m_3x_3 + \dots + m_nZ + U' \quad \dots (4.4)$$

$$Y^N = p_0 + p_1x_1 + p_2x_2 + p_3x_3 + \dots + p_nL + V' \quad \dots (4.5)$$

There is no a priori reason to prefer (4.4) and (4.5) to (4.2) and (4.3) or vice versa. However, there is a point to be noted here.

Profits before tax is equivalent to profits after tax plus tax provision. Thus, when Y^E and Y^N are defined with reference to equity base only, we have the identities:

$$Y^n = (1 - Z)Y^E, \quad \dots (4.6)$$

$$\text{and } Y^E = Y^n - L. \quad \dots (4.7)$$

Then, taking (4.4)

$$Y^n = m_0 + m_1x_1 + m_2x_2 + m_3x_3 + \dots + m_nZ + U',$$

$$\text{or, } (1-Z)Y^E = m_0 + m_1x_1 + m_2x_2 + m_3x_3 + \dots + m_nZ + U',$$

$$\text{or, } Y^E = \frac{m_0}{1-Z} + \frac{m_1}{1-Z} x_1 + \frac{m_2}{1-Z} x_2 + \frac{m_3}{1-Z} x_3 + \dots \\ + \frac{m_n}{1-Z} Z + \frac{U'}{1-Z} \quad \dots (4.4)'$$

This can be looked at the other way round also, starting from (4.2). Either way, it is clear that if one of (4.2) and (4.4) is linear, the other cannot be. Thus both (4.2) and (4.4) cannot be estimated within the same model. Gandhi committed this mistake when he estimated Y^E (equity base) equation to support his findings using the Y^n equation.⁵

This problem, however, does not arise in the case of model A, because the two equations (4.3) and (4.5) are perfectly compatible as can be easily seen. If the specification and estimation is perfect, i.e., all the relevant variables are taken into account and all the assumptions of least-squares regression are met, the estimated c_n will be equivalent to $(1 + p_n)$. However, since it cannot be so perfect (it is

⁵ See Ved P. Gandhi, "Company Tax Incidence—Industry Studies," Indian Economic Review, Vol. 3 (New Series), April 1968, pp. 42 and 46 (footnotes 28 and 29), where he gives PBT/NW equation in support of his PAT/NW equation for the aluminium, and electricity generation and supply industry.

impossible to take into account all the relevant variables), the estimation can be taken to be reasonable if c_n approximately equals $(1 + p_n)$.

But there is one major problem in this model also. Definitionally, L is equal to $Y^E Z$ and thus not independent of Y^E . Thus, $E(L_t U_t) \neq 0$ and the regression coefficients will not be consistent if L is used as an independent variable to explain Y^E .

K-M applied the instrumental variable technique to circumvent this problem. The instruments chosen were the effective tax rate and the statutory tax rate. Laumas also used the same method while measuring shifting in India.

Rao, however, did not favour the instrumental variable method for the Indian data.⁶ His objections were mainly two. First, for the data for the sample companies reported by RBI, Z does not satisfy the requirements of a good instrument, which it did for K-M. A good instrumental variable must have the property of high correlation with the dependent variable as well as the variable for which it is acting as an instrument. This property was checked by K-M and found to be satisfactory; but Laumas overlooked this and committed the error of choosing an instrument which did not satisfy this property. Z does not have a high correlation with L and Y^E as far as the Indian data is concerned.

6 See V.G. Rao, op.cit., pp. 43-44.

His second objection was based on Malinvaud's finding that instrumental variable method is inferior to OLS for samples of size 20 or less. Neither K-M's sample nor that of Laumas had observations over twenty. Due to these two reasons, Rao preferred OLS to the instrumental variable method.

4.2 Measures of Shifting

Full shifting, zero shifting and partial shifting have been defined earlier in a general way, but now it is necessary to redefine them keeping in view the model being used.

Let us define a hypothetical profit rate (gross, equity base) Y_0^E where all other variables have the same value as in the time period t except the tax rate, which is zero. Then,

$$Y_t^E = a_0 + a_1x_{1t} + a_2x_{2t} + \dots + a_nL_t \quad \dots (4.8)$$

$$Y_0^E = a_0 + a_1x_{1t} + a_2x_{2t} + \dots + a_{n-1}x_{n-1,t} \quad \dots (4.9)$$

using model A, or

$$Y_t^E = c_0 + c_1x_{1t} + c_2x_{2t} + \dots + c_nZ_t \quad \dots (4.10)$$

$$Y_0^E = c_0 + c_1x_{1t} + c_2x_{2t} + \dots + c_{n-1}x_{n-1,t} \quad \dots (4.11)$$

using model B.

Now, full shifting is defined as a situation where $Y_t^E - L_t = Y_0^E$, that is, the tax liability rate is recovered in full through the equivalent rise in gross profit rate. Conversely, zero shifting is defined as $Y_t^E = Y_0^E$, that is, the introduction of the tax does not have any effect on the gross profit rate. Thus,

$Y_t^E = Y_0^E + L_t$ signifies full shifting, and

$Y_t^E = Y_0^E$ signifies zero shifting.

This immediately suggests a general shifting measure $s = (Y_t^E - Y_0^E)/L_t$, where s measures the degree of shifting.

Taking model A,

$Y_t^E - Y_0^E = a_n L_t$, and so,

$s = a_n L_t / L_t = a_n$. The coefficient of L_t in the estimated equation directly gives us the degree of shifting, and it turns out to be a constant.

Taking model B,

$Y_t^E - Y_0^E = c_n Z_t$, and so,

$s = c_n Z_t / L_t = c_n Z_t / Z_t Y_t^E = c_n / Y_t^E$.

This measure is dependent on the value of Y_t^E as well as the coefficient of Z_t in the estimated equation and thus it varies with the value of Y_t^E . However a rough summary measure would be $\overline{c_n / Y_t^E}$ or $c_n / \overline{Y_t^E}$, where the bar over the variable represents its mean value over the sample period. Which one of these two should be used is a matter of choice, but it is not very important because the two values will not be very different from each other. K-M preferred the latter in their calculations.

4.2.1 Data Availability

Our main concern being explanation of profit rates, the data for the profit rates and for the other variables which could explain profit rates were required. Moreover,

all these data were needed in an industrywise disaggregated form. Although for all the studies done so far only financial data were used, it was believed useful to experiment with variables which were not financial in nature also.

As for the financial data, the earlier studies used data taken from either various issues of Reserve Bank of India Bulletin or National Income Estimates. The same data are now available for the period upto 1974-75.

However, even with respect to figures pertaining to the period common to the present study and the earlier ones, the figures are not always the same due to revision.

Reserve Bank of India brought out a publication containing data on company finances a few years ago.⁷ This publication contained revision of the data which were published in the R.B.I. Bulletin's quinquennial series on the finances of joint stock companies (medium and large) for the years 1960-61 to 1970-71. Another publication provided similar data for the years 1970-71 to 1974-75.⁸ If we could use similar data for the years 1950-51 to 1959-60 from the Bulletin, we could have had twenty-five observations at our disposal. Data relating to national income and other aggregates were taken from the latest available Estimates of National Income.

7 Department of Statistics, Financial Statistics of Joint Stock Companies in India, 1960-61 to 1970-71, Reserve Bank of India, Bombay, 1973.

8 Financial Statistics of Joint Stock Companies in India: 1970-71 to 1974-75, Reserve Bank of India, Bombay, 1978.

However, data for all the twenty-five years have not been used in our study. The sample companies data for the period 1950-51 to 1954-55 could not be used because of definitional discrepancies. Every five years, the Reserve Bank makes some changes in the collection of the data on finances of sample companies. These changes are sometimes methodological, sometimes taxonomical and sometimes definitional, leaving aside changes in coverage. It was found that though data for 1955-56 onwards could be made more or less comparable with some adjustments,⁹ it was impossible to do so for the data for earlier years.

Similarly, some national income and related aggregate figures also will be different from those used by earlier authors, because the latest available figures and revised figures for the earlier years have been used in the present study.

The various issues of Statistical Abstract for the Indian Union provided some data which were non-financial in nature. The other non-financial data were collected from many different sources, a major such source being reports of various Tariff Commissions. All such sources are given in the Appendices which tabulate all the data used.

4.2.2 Nature of the Data

Since the data provided by the Reserve Bank is our major data source, it will probably be useful to give a brief

⁹ See the notes in Appendix A, for details about the problems and adjustments.

description of the methodology, coverage and nature of these data.

The Reserve Bank of India has been collecting these data since 1950-51 and presenting them in their Bulletin and occasionally in separate publications.

The joint stock companies in India have a statutory obligation to submit a copy of their annual financial assessments every year to the Registrar of Companies. All financial data related to companies usually flow from this source. However, Stock Exchange directories would also give similar data, though their figures may not be in sufficient detail and the coverage of companies is not complete. The Reserve Bank's methodology is first to classify all companies into government and non-government. Non-government companies are further classified into domestic and foreign. The domestic companies are further sub-divided into public and private. The domestic, non-government public limited companies are then divided into two groups: small (with paid-up capital below Rs. 5 lakhs) and large and medium. The latter group constitutes the population for the sample companies, data for which we have used, after separating financial companies. Thus, government companies, foreign companies, private limited companies and small companies are excluded in the data that we use.

The exclusion of government companies, for our present purpose, is quite desirable, because the decision-making in government companies is influenced by several other factors

than in the non-government ones, and even the common factors may be important to a lesser degree. For example, profit-making may not be one of the priority objectives at all in a government company producing life-saving drugs; it may be to produce as much as possible and sell at as low a price as possible. Pricing in public enterprises is expected to be different from private enterprises. Data for companies including government companies would have made interpretation of the results derived from them very difficult.

Private limited companies, however, constitute about 30 per cent of the total paid-up capital of non-government companies on the average. Exclusion of these companies, therefore, does limit the coverage. But even in their case, the set-up is different, the major difference being the small number of owners and absence of public sale of shares. Naturally, the financial decision-making is different from those in public limited companies. Thus, again, it would have created difficulties in interpretation if the data included that for private limited companies. However, in most industries where corporate form is dominant, and generally speaking, these companies are many but small, unlikely to exercise much control over the industry. Finally, the issue is clinched by the fact that we intend to do an industrywise analysis, whereas the RBI data for private limited companies is given only in an aggregate form, not industrywise.

The data relating to the growth of corporate sector in India is presented in Appendix Table E. It can be easily seen

that it has grown considerably, and to keep pace with it, the RBI sample was revised every five years. Over the five year period, however, the companies included in the sample remain the same except in special cases like liquidation of a company, or government take-over, or merger. The data we use, as mentioned above, pertain to only medium and large non-government, non-financial, domestic public limited companies. The samples covered around fifty per cent of the total non-government companies in terms of paid-up capital in 1956-57, but it steadily moved up to about seventy per cent in 1974-75. The coverage out of non-government public limited companies only moved up from about 60 per cent to around 80 per cent. This is possible despite excluding small companies and foreign companies because they constitute a very small percentage of the total paid-up capital. Taking individual industries, the Bank has kept the minimum sample coverage at around 60 per cent of the total paid-up capital in individual industries.

The effect of these exclusions on the results arrived at is difficult to guess. They might have introduced a bias in the results, the direction which is uncertain. The bias introduced depends upon the behaviour of the groups excluded, and no study has been made to determine their behaviour pattern, shifting in particular, so far. The seriousness of the bias, if it is there, is fortunately lessened due to the overwhelming importance of the group analysed. Nevertheless, we cannot rule out the possible bias, and the results arrived at is of

limited applicability to that extent. Before generalizing our results for the whole corporate sector, one must reasonably satisfy himself about the direction and extent of these possible bias.

There may be some bias from another source. As mentioned above, the coverage of the data is continuously changing. But the sample is changed to take into account these changes only once in five years. It is likely that data for the sample companies slowly become unrepresentative of the population data over these five-year periods. This might have imparted a bias to our results, the direction of which is again uncertain. Fortunately, due to disaggregation, the bias is likely to be small in extent. In the case of iron and steel, it is not present at all, because the sample is equivalent to the population, which has remained constant over the whole period. Because of this, no adjustment of data to allow for the change in representativeness was attempted.

The figures reported by the Bank are combined figures of the sample companies as reported in their individual balance-sheets and profits and loss accounts, within the respective groups. To decide the industry affiliation of individual companies, the source of their income is examined. If more than half of its income is from a particular industry, the company is considered to be completely within that industry, even though it may be turning out products for other industries by way of diversification. If a company cannot be classified

into a particular industry in this manner, it is put in a suitable broader group but not included in a particular industry. For example, suppose a company produces cement, paper, and engineering goods, each contributing equally to its income. According to the RBI methodology, the company cannot be classified into any of the three industries, but it can be included in the broader group 'Processing and Manufacture'.

The classification into industries has also undergone changes from time to time. These changes are in the nature of splitting one industry into two, giving data for an industry separately which was earlier grouped with 'others', or sometimes even dropping a particular industry and including the data for it in the broader group only. This sort of changes in classification restricts to some extent the number of industries that can be studied. For example, data for coal and mineral oil industries are not given separately for all years. Other such industries are matches, woollen textiles, silk and rayon textiles, motor vehicles, etc.

The other data were collected, as far as possible, from government publications. Our primary interest in collecting non-financial data was to use two variables in our regressions—capacity utilisation and concentration. These were, of course, not necessary for all industries, but there is sufficient empirical evidence that these two variables are important in explaining profit rates in a large number of industries. The capacity figures are that of installed capacity (not licensed)

because that figure is more relevant in calculating capacity utilisation. Whenever necessary, the data from government publications were supplemented by data from other sources. A secondary objective of collecting non-financial data was to get a clear picture of the industry situations, necessary for the interpretation of our results as well as to find out any possible pattern in the industry situation on the one hand and the degree of shifting on the other.

4.3 Rationale for an Industrywise Study of Shifting

Theoretical discussions tell us that shifting of the tax under consideration depends on various factors like market structure, nature of demand for and supply of a product, degree of unexploited monopoly power, the relative importance of profit motivation, etc. It is obvious that these variables are quite different in different industries and hence the degrees of shifting may also be different. An aggregative study of shifting with reference to the whole corporate sector will not bring this out. A secondary reason for doing such a disaggregated study is that it may perhaps be possible to find out a systematic relationship between the market structure and the degree of shifting.

Disaggregated studies are necessary from the policy-making angle also. Even at present there are numerous provisions in the Income Tax Act which refer to a specific industry or a group of industries only. Development allowance for the tea plantations and higher development rebate to priority

industries can be cited as examples. These are obviously attempts to encourage growth in some desirable industries re-allocating resources from the less desirable ones. These special provisions have the effect of making the effective tax rates different in different industries. Industrywise shifting analysis will help to rationalize such a structure.

The importance of disaggregative studies has been felt by many earlier authors. K-M and Gordon, as discussed in the preceding chapter, show some disaggregated results too, using the same model built for the aggregative analysis. Laumas has done the same for a number of Indian industries. The studies by Moffat and Mikesell (also discussed in Chapter 3) were attempts to examine shifting in particular industries only. Gandhi examined shifting in the corporate sector as a whole, as well as in three individual industries. The variables used by Gandhi to estimate industrywise shifting are to a great extent, differing from the aggregative profit function. To the extent that his disaggregated study was not just applying the aggregative profit function to the industry data but a different function, it can be called the first disaggregated study proper of corporation income tax shifting in India. The next, and the latest so far, is that of Rao. Both Gandhi's and Rao's contributions are discussed in the preceding chapter.

4.3.1 The Selected Industries

The industries analysed here are seven: tea plantations, sugar, cotton textiles, iron and steel, aluminium, paper and paper products, and cement. Although the focus is on these

particular industries, some equations earlier estimated by different authors have been re-estimated with more recent data for the whole corporate sector also. The selected industries are by no means exhaustive of the different industries in India, but they can be termed as among the most important industries from the economy's viewpoint.

In the first quinquennial series on the data for sample companies, there were 30 separate industry groups. In the second series a new industry, mineral oils, was added bringing the number of industries to 31. However, out of these, use of data for the following six industries were ruled out: coal, silk and woollen textiles, transport equipment, other machinery, matches, and mineral oils. This was due to the changes in industry classification. Thus, financial data for 25 different industries were available for the period under consideration.

Our next consideration was that the industries selected should have a clearly identifiable products or a group of products which are sufficiently homogeneous to be produced in a single firm. On this criterion the following five industries were eliminated: grains and pulses, vegetable and hydrogenated oils, basic chemicals, other chemicals, and pottery, china and earthenware. This brought the number of industries down to 20.

The final consideration was easy accessibility of supplementary data as mentioned earlier. We were primarily interested in physical output of at least the bigger firms in the industry and capacity utilisation. Besides, information on pricing,

distribution, raw material availability and prices, extent of non-corporate sector, etc., were also needed.

We finally ended up with the seven industries enumerated above. Even for these industries, we do not have all the data that we would have liked to have (for example, for the paper and cement industries we do not have a continuous time series data on production of even all the large firms), but at least the data that we have, gives a clear enough picture of the changing situation in those industries.

With additional effort, one could probably have data for more industries, but a single researcher has to work under various constraints which prevents the study from being really comprehensive.

4.4 The Re-estimated Equations

The starting point of our empirical analysis is the re-estimation of the various profit functions estimated by the authors of three econometric studies for India—Laumas, Gandhi and Rao—for the selected industries and with our more recent set of data. This, obviously, is an attempt to test the stability of the function and consequently, the stability of the degree of shifting. Since we have already described and discussed their specifications and estimations in Chapter 3, there is no need to repeat it at this point. Tables 4.1 through 4.3 give the results of the re-estimations of the equations earlier estimated by Laumas, Gandhi and Rao respectively.

In the discussion above on the data used, it was mentioned that the figures used by us, even for the periods common to the original studies and the present re-estimations, are not the same as earlier. This is because of the revision in the data after the original studies were completed. Thus, the difference in data set relate to not only the absence of data for the years 1950-55 and addition of data for the years ending in 1974-75, but also the revision made in the data for the years 1960-61 to 1964-65. However, the latter difference is not substantial. One can certainly call the data set used here as the same data set for a different period, as compared to the data used by earlier authors.

4.4.1 The Laumas Equations

The earlier estimations by Laumas were for the years 1950-62 for his aggregative analysis and for 1950-64 for the industrywise analysis. We tried to fit a similar function into more recent data - those for the years 1955-75.

In Chapter 3, while discussing Laumas' contribution, we had noted that the function estimated for his aggregated study was used in the disaggregated study also. Actually, the idea of the same function explaining profits in the industries as well as the whole corporate sector seems somewhat far-fetched. In the aggregative function, there are bound to be only macro-variables, and the assumption that the same variables will explain the year-to-year industry profit rates is probably unrealistic. The industry profit rates should

Table 4.1 : Re-estimated Y^S Equations (Laumas) for the Years 1954-55 to 1974-75

Industry	Regression Coefficients of: (t-values in parentheses)						R^2	\bar{R}^2	F Statistic
	Constant	Z_t	V_{t-1}	J_t	Q_t	Q_t			
	0.0457 (0.0468)	0.1877 (0.9766)	-0.9793 (-1.4509)		1.2772 (1.2557)	0.1816 (0.1654)	0.1895	-0.0266	0.8768

* Significant at 95% confidence level (constant terms not considered).

preferably be explained with the help of mainly industry variables. However, even in the aggregative function, there are a few variables which have a twin character; when the specification refers to an industry they assume the character of an industry variable by simply restricting the coverage of its definition. They are not inherently macro variables like, say, per capita income. The variables calculated from sample companies data, e.g. V_c (inventory/sales), have such a dual character. When being used in the aggregative function, the definition refers to the whole corporate sector. But when applied to a particular industry, it refers to only that industry. Combinations of such variables with purely macro-economic variables may conceivably yield a specification which explains both aggregate as well as disaggregated profit rates well enough. At any rate, one cannot be sure that they do not. For this reason, we have not ruled out the function estimated by Laumas in the application to specific industries.

Notice has to be drawn to one feature of the present re-estimation. The equations estimated here are not exactly the same as estimated by Laumas, but have two differences.

First, Laumas had used J_c (total revenue except corporation income tax/national income) and G_c (public expenditure/national income) together in his estimation which was justifiably objected to by Rao on grounds of harmful multicollinearity.¹⁰

10 V.G. Rao, op.cit., pp. 113-115.

For our set of data also, the multicollinearity apparently persists, since the simple correlation coefficient between J_t and G_t is to the tune of 0.9785, which is very high by itself and also in comparison to the multiple correlation coefficient. Hence, we have not used both the variables together in our estimation, but have used them alternatively.

Second, the original K-M equations which Laumas followed had the variable ΔC_{t-1} in the list of explanatory variables. Laumas used ΔC_t instead, found it to be insignificant, and dropped it in his final estimation. We have neither used ΔC_t or ΔC_{t-1} , nor have we dropped it altogether. Instead, we have used the variable C_t as an explanatory variable in the hope that the absolute propensity to consume (C_t) may explain profits better than the marginal propensity to consume (ΔC_t).¹¹ And even if they do not, the fit (as judged only by R^2) cannot be worse than without the variable altogether because simply dropping an explanatory variable automatically lowers R^2 (though not \bar{R}^2).

Table 4.1 reports the results of our experimentation with a Laumas-type equation for the whole corporate sector and the seven industries chosen. Z_t and V_{t-1} (inventory/sales, one year lagged) are the dual-character variables whereas J_t , G_t and C_t (consumption/national income) are pure macroeconomic

11 K-M did not provide any rationale for using ΔC_{t-1} . This has been a point for criticism for many subsequent reviewers as discussed in Chapter 3.

variables. The results clearly show that the specification leaves a lot to be desired.

In case of two industries (Tea Plantations and Aluminium), not a single explanatory variable is significant at 95 per cent level of significance. Naturally, the R^2 's are very low. For that matter, the largest R^2 is 0.6918 (Iron and Steel equation using G_c), whereas in his original estimations Laumas had quite a few R^2 's greater than 0.8. In no equation all the variables are significant. The R^2 's are generally very low. Only in seven equations out of 16 are they significant at 95 per cent level of significance using the F-test. Thus, the performance of this specification in explaining profit rates is dismal in the case of individual industries, and not very satisfactory (only G_c or J_c is significant) in the case of the whole corporate sector too. This implies that there are important explanatory variables omitted in this specification which makes all the coefficients calculated suspect. Therefore, we cannot accept the shifting conclusions drawn from such an experiment.

4.4.2 The Gandhi Equations

Gandhi's original estimates of the profit equations for the whole corporate sector and for three industries—electricity generation and supply, aluminium and matches—were for the years 1950-61. The results of using the same formulation for the whole corporate sector and the seven selected industries are tabulated in Table 4.2 for the years 1955-75.

Table 4.2 : Regressions Estimated Using Gandhi Specification for the Years 1955-75

Industry	Dependent Variable	Regression Coefficients of: (t-values in parentheses)					R ² (F-value)	R ²	
		Constant	Z _t	CS _t	CG _t	CT _t			
1. Tea Plantations	PAT/NW	0.6954 (7.1627)	-0.1226* (-2.4629)	-0.0816 (-0.8062)	-0.6537* (-8.3895)	0.0568* (9.4757)	0.9267 (47.3968)	0.9071	
	PBT/NW	1.4496 (5.9543)	0.0911 (0.7296)	-0.2592 (-1.0210)	-1.4885* (-7.6174)	0.1278* (8.4970)	0.8960 (32.3105)	0.8683	
	GP/KE	1.2093 (5.5390)	0.0894 (0.7982)	-0.0465 (-0.2043)	-1.4578* (8.3189)	0.1420* (10.5273)	0.9202 (43.2274)	0.8989	
2. Sugar	PAT/NW	1.5487 (4.7020)	-0.0926 (-1.3798)	-0.2347* (-2.3435)	-1.4644* (-4.4959)	0.0399* (3.9275)	0.8257 (17.7708)	0.7793	
	PBT/NW	3.1147 (4.4982)	0.0910 (0.6452)	-0.5189* (-2.4645)	-3.0620* (-4.4717)	0.0821* (3.8464)	0.7233 (9.8005)	0.6495	
	GP/KE	1.8849 (4.9245)	-0.0661 (-0.8475)	-0.0826 (-0.7096)	-2.0919* (-5.5269)	0.1304* (11.0470)	0.9083 (37.1294)	0.8838	
3. Cotton Textiles	PAT/NW	1.7862 (5.9682)	-0.0281 (-0.9929)	-0.1691* (-3.6646)	-1.6323* (-4.9918)	-0.0239 (-1.4869)	0.8658 (24.1854)	0.8300	
	PBT/NW	2.6356 (6.6940)	-0.0139 (-0.3738)	-0.2273* (-3.7428)	-2.4147* (-5.6130)	-0.0368 (-1.7435)	0.8695 (24.9782)	0.8347	
	GP/KE	1.8117 (10.5672)	-0.0225 (-1.3901)	-0.1038* (-3.9240)	-1.8121* (-9.6739)	0.0458* (4.9799)	0.9493 (70.3023)	0.9359	
4. Iron and Steel	PAT/NW	0.8220 (9.1790)	-0.0881 (-1.6845)	-0.0622 (-0.7627)	-0.9466* (-8.7563)	0.1138* (3.1120)	0.8843 (26.7471)	0.8512	
	PBT/NW	1.2473 (8.3057)	0.0808 (0.9210)	-0.1130 (-0.8258)	-1.5162* (8.3630)	0.1776* (2.8954)	0.8540 (20.4754)	0.8123	
	GP/KE	0.8318 (7.7410)	0.0471 (0.7511)	-0.0577 (-0.5896)	-1.0762* (-8.2964)	0.2057* (4.6880)	0.8823 (26.2482)	0.8487	
5. Aluminium	PAT/NW	0.5153 (8.7960)	-0.1377* (-5.0769)	-0.2001* (-1.8207)	-0.5062* (-5.3241)	0.2077* (3.3082)	0.8452 (19.1107)	0.8010	
	PBT/NW	0.7454 (9.6595)	0.0236 (0.6603)	-0.3136* (-2.1666)	-0.8937* (-7.1377)	0.3808* (4.6050)	0.8325 (17.3916)	0.7846	
	GP/KE	0.5065 (8.6842)	0.0174 (0.6458)	-0.1022 (-0.9345)	-0.6561* (-6.9334)	0.2473* (3.9582)	0.7987 (13.8912)	0.7412	
6. Cement	PAT/NW	1.1121 (8.6069)	-0.0103* (-3.8076)	-0.2276* (-5.3919)	-1.1121* (-9.3487)	0.0746* (6.3223)	0.9570 (77.8279)	0.9447	
	PBT/NW	1.5328 (9.7372)	-0.0066* (-2.0084)	-0.1887* (-3.6683)	-1.7432* (-12.0272)	0.1605* (11.1604)	0.9697 (111.9288)	0.9610	
	GP/KE	1.1643 (10.0457)	-0.0064* (-2.6367)	-0.0819* (-2.1625)	-1.4249* (-13.3529)	0.1897* (17.9161)	0.9796 (168.4043)	0.9738	
7. Paper	PAT/NW	0.6277 (5.2425)	-0.1710* (-6.4475)	0.1148* (2.8575)	-0.8650* (-7.2265)	0.1246* (6.1556)	0.9642 (101.0196)	0.9547	
	PBT/NW	1.0101 (4.7490)	0.0339 (0.7185)	0.1005 (1.4086)	-1.4862* (-6.9896)	0.2257* (6.2766)	0.9593 (88.4784)	0.9485	
	GP/KE	0.8216 (4.7041)	0.0458 (1.1845)	-0.0473 (-0.8076)	-1.1119* (-6.3689)	0.2303* (7.8008)	0.9620 (94.8521)	0.9518	
8. Whole Corporate Sector	PAT/NW	0.2926 (3.7676)	-0.1504* (-2.1661)	-0.4542* (-1.9980)	0.4329* (2.9151)	-0.0457* (-1.7956)	0.0005* (2.5390)	0.7600 (8.8686)	0.6743
	PBT/NW	0.4088 (2.6570)	0.0549 (0.3989)	-0.8909* (-1.9784)	0.8080* (2.7466)	-0.0882 (-1.7474)	0.0010* (2.4586)	0.7166 (7.0811)	0.6154
	GP/KE	0.0921 (0.9326)	-0.0063 (-0.0710)	-0.3948 (-1.3663)	0.5976* (3.1654)	-0.0611* (1.8862)	0.00002 (0.0723)	0.8468 (15.4774)	0.7921

* Significant at 95% confidence level (constant terms not considered).

It can be easily seen that these results are far more impressive than the ones using Laumas-type equation. The fits are uniformly good for each industry and for each definition of rate of return. The lowest R^2 is 0.7166 (Y^E , equity base, equation for the whole corporate sector) and the highest is 0.9796 (Y^E , total base, equation for the cement industry). All the R^2 's are significant at 99 per cent level of confidence using the F-test. As far as the individual industries are concerned, which we intend to focus on, the fits are quite good, and particularly so in the case of cement and paper. Out of the three non-tax variables, at least two are always significant at 95 per cent level of significance.

Of the variables used, there are two whose signs can be predicted a priori. The CO_c (cost of goods sold/sales) variable obviously should have a negative sign because this is the inverse of profit margin. CT_c (sales/capital employed) or turnover ratio should have, equally obviously, a positive coefficient normally. As to the third non-tax variable CS_c (net worth/capital employed), the sign cannot be predicted with any reasonable degree of certainty. This is because it depends on the relative cost of debt and share capital vis-a-vis the actual rate of return and various other factors concerned with leverage. But since the Y^E (total base), i.e. gross profits/capital employed variable includes both interest and profits before tax, CS_c should not have a very important effect on it.

The mathematical sign of CG_t variable conforms to our expectation in all cases. So does the sign of CT_t , except in cotton textiles (two equations out of three). The CS_t variable has a negative sign in all cases except two (in the first two equations for paper industry). In the Y^E (total base) equations, it is significant in two out of eight cases whereas we expected it to be insignificant for all eight.

Thus, on the whole, the performance of this specification is satisfactory on the basis of mere re-estimation with more recent data. The 'wrong' sign for CT_t in cotton textile industry may perhaps be explained, but for the present, it is not necessary to go into that. It is to be noted that this specification consists entirely of the cost-side variables, i.e. variables within the firms in the industry. Demand-side variables are not present. Moreover, there is no macroeconomic variable at all, Z_t , CS_t , CG_t and CT_t all referring to the industry.

4.4.3 The Rao Equations

Next, we re-estimate the functions estimated by Rao for the years 1950-65 originally. Our estimations use the data for 1955-75, as noted earlier. Table 4.3 gives the estimated equation for Y^E (equity base) and Y^E (total base), each using two alternative definitions of the tax rate, Z_{t-1} and L_{t-1} .

It can be seen easily from the table that the performance of this equation also for the more recent set of data is quite satisfactory using either of the two tax rates, in terms

Table 4.3 : Regression Results Using the Rao Equations for the Years 1955-75

Industry	No. of Observations	Dependent Variable	Regression Coefficients (t-values in parentheses)							R ² (F-value)	R ²
			Constant	Z _{t-1}	L _{t-1}	V _t	CT _t	CP _t	I _t		
1. Tea Plantations	20	PBT/NW	1.0059 (4.5558)	-0.0601 (-0.8220)		0.4162* (1.9317)	0.1739* (11.9652)	-1.4333* (-8.3622)	0.9351 (54.0625)	0.9178	
		PBT/NW	1.0122 (4.2263)		0.0862 (0.5778)	0.4036 (1.7056)	0.1726* (11.4078)	-1.4784* (-7.5539)	0.9337 (52.8016)	0.9160	
		GP/KE	1.0317 (4.7485)	-0.0397 (-0.5514)		0.2853 (1.3454)	0.1720* (12.0260)	-1.3977* (-8.2871)	0.9401 (58.8049)	0.9241	
		GP/KE	1.0015 (4.2544)		0.0115 (0.0787)	0.3112 (1.3381)	0.1723* (11.5851)	-1.3997* (-7.2767)	0.9389 (57.5875)	0.9226	
2. Sugar	20	PBT/NW	1.2853 (2.6057)	-0.1460 (-1.0706)		-0.1170 (-0.8967)	0.0344 (0.9204)	-1.1755* (-1.8359)	0.4350 (2.8874)	0.2844	
		PBT/NW	2.4387 (3.5922)		1.2970* (2.1916)	0.1267 (0.9203)	0.0719* (1.9033)	-2.9471* (-3.1746)	0.5394 (4.3913)	0.4165	
		GP/KE	1.2538 (3.2808)	0.0018 (0.0171)		0.0750 (0.7414)	0.1062* (3.6701)	-1.4780* (-2.9793)	0.6320 (6.4424)	0.5340	
		GP/KE	1.9924 (3.7953)		0.8524* (1.8630)	0.1974* (1.8552)	0.1306* (4.4754)	-2.5390* (-3.5370)	0.7012 (8.8004)	0.6215	
3. Cotton Textiles	20	PBT/NW	2.3890 (5.5766)	-0.0307 (-0.7681)		-0.4936 (-0.9952)	-0.0362 (-1.0205)	-2.1720* (-3.9427)	0.7216 (9.7191)	0.6473	
		PBT/NW	2.4278 (5.9388)		0.4314 (0.8326)	-0.4978 (-1.0070)	-0.0380 (-1.0846)	-2.2532* (-4.3567)	0.7234 (9.8083)	0.6497	
		GP/KE	1.7946 (8.8875)	-0.0201 (-1.0671)		-0.3299 (-1.4112)	0.0443* (2.6502)	-1.7691* (-6.8129)	0.8734 (25.8776)	0.8397	
		GP/KE	1.8361 (9.3509)		0.1999 (0.8033)	-0.3217 (-1.3548)	0.0427* (2.5344)	-1.8373* (-7.3962)	0.8694 (24.9719)	0.8346	
4. Iron and Steel	19	PBT/NW	1.3287 (10.6860)	0.1654* (2.9184)		0.0543 (0.3864)	0.1333* (3.5805)	-1.7286* (-9.0104)	0.8994 (31.2984)	0.8707	
		PBT/NW	1.0222 (10.2483)		0.6386* (4.2761)	0.1449 (1.2484)	0.1590* (5.4851)	-1.3868* (-8.9356)	0.9299 (46.3932)	0.9099	
		GP/KE	0.9125 (11.0991)	0.1264* (3.3738)		0.0601 (0.6471)	0.1785* (7.2514)	-1.2570* (-9.9088)	0.9308 (47.0551)	0.9110	
		GP/KE	0.6856 (10.0346)		0.4565 (4.4620)	0.1281 (1.6112)	0.1989* (10.0180)	-1.0034* (-9.4376)	0.9482 (64.0385)	0.9334	

(continued)

Table 4.3 : (continued)

Industry	No. of Observations	Dependent Variable	Regression Coefficients (t-values in parentheses)						R ² (F-value)	R ²	
			Constant	Z _{t-1}	L _{t-1}	V _t	CT _t	CP _t			I _t
5. Aluminium	19	PBT/NW	0.7726 (9.0201)	0.0317 (0.8655)		-0.4647* (-2.4234)	0.1676* (2.6896)	-0.7879* (-6.3189)	0.8380 (18.1047)	0.7917	
		PBT/NW	0.7441 (8.1770)		0.1888 (0.9364)	-0.4783* (-2.4657)	0.1662* (2.6811)	-0.7403* (-5.0664)	0.8394 (18.2918)	0.7935	
		GP/KE	0.5396 (8.9617)	0.0296 (1.1477)		-0.2578* (-1.9126)	0.1514* (3.4566)	-0.5726* (-6.5314)	0.8316 (17.2856)	0.7835	
		GP/KE	0.5142 (8.0287)		0.1688 (1.1894)	-0.2685* (-1.9662)	0.1510* (3.4598)	-0.5312* (-5.1653)	0.8327 (17.4174)	0.7849	
6. Cement	19	PBT/NW	1.2328 (10.9875)	-0.0373 (-0.6169)		0.0292 (0.2820)	0.1760* (4.9292)	-1.6094* (-9.5901)	0.8925 (29.0576)	0.8618	
		PBT/NW	1.1006 (10.0501)		0.3897* (1.8927)	-0.0188 (-0.2039)	0.1493* (4.4833)	-1.4281* (-8.6415)	0.9121 (36.3064)	0.8870	
		GP/KE	1.0823 (14.5459)	-0.0098 (-0.2437)		0.0416 (0.6050)	0.1994* (8.4206)	-1.4486* (-13.0161)	0.9414 (56.2567)	0.9247	
		GP/KE	1.0037 (14.0908)		0.2634* (1.9668)	0.0160 (0.2681)	0.1835* (8.4729)	-1.3388* (-12.4544)	0.9539 (72.4456)	0.9407	
7. Paper	20	PBT/NW	1.1951 (5.7747)	0.0712 (1.7497)		-0.3063* (-2.1283)	0.2349* (6.4484)	-1.5229* (-6.9579)	0.9612 (92.8560)	0.9508	
		PBT/NW	1.2417 (5.6346)		0.2118 (0.9829)	-0.2563 (-1.6835)	0.2140* (5.9760)	-1.5537* (-6.6226)	0.9561 (81.6489)	0.9444	
		GP/KE	0.8486 (4.5371)	0.0119 (0.3238)		-0.1005 (-0.7730)	0.2298* (6.9812)	-1.1346* (-5.7362)	0.9560 (81.5058)	0.9443	
		GP/KE	0.9291 (5.1135)		-0.1816 (-1.0219)	-0.1071 (-0.8532)	0.2215* (7.5037)	-1.2043* (-6.2262)	0.9586 (86.8083)	0.9475	
8. whole Corporate Sector	20	PBT/NW	0.9235 (1.6610)	-0.0801 (-0.6540)		-0.7179 (-1.5496)		-0.7197 (-1.1145)	0.8326* (3.6544)	0.6334 (6.4799)	0.5357
		PBT/NW	0.8380 (1.5735)		0.6885 (1.4187)	-0.7743 (-1.7465)		-0.6368 (-1.0296)	0.5185* (1.7903)	0.6676 (7.5309)	0.5789
		GP/KE	0.7033 (2.1159)	0.1062 (1.4504)		-0.4173 (-1.5068)		-0.6615 (-1.7138)	0.8209* (6.0280)	0.8281 (18.0598)	0.7822
		GP/KE	0.6431 (2.0015)		0.5489* (1.8745)	-0.4804* (-1.7958)		-0.5245 (-1.4055)	0.6413* (3.6698)	0.8412 (19.8577)	0.7988

* Significant at 95% confidence level (constant term not considered).

of explanatory power. The R^2 's range from 0.4350 (Y^E , equity base, equation for the sugar industry using Z_{t-1}) to 0.9612 (Y^E , equity base, equation for the paper industry using Z_{t-1}). Actually, most of the R^2 's are above 0.8 indicating a fairly good fit. All of them are significant at 95 per cent level of significance as per the F-test, except the R^2 of 0.4350, given above as the minimum value of R^2 among all the estimated equations. Except for sugar industry, the other industry results are reasonably good. The result for the whole corporate sector, however, is not as good as one would have liked it to be. The profit margin variable (CP_t) has the expected negative sign in all cases. The CT_t variable (turnover ratio) has the expected positive sign in all cases except the two Y^E (equity base) equations in cotton textiles industry. It may be recalled that results using Gandhi specification also shows the same behaviour. The sign of V_t (inventory/sales) cannot be predicted a priori, and it keeps changing in the estimated equations. The industries where the performance of this specification is really good are tea plantations, iron and steel, paper and cement. Thus, considering the explanatory power and the mathematical signs of the coefficients, the performance of this specification also is reasonably good.

4.5 The choice of Specification

After re-running the regressions following Laumas, Gandhi and Rao, a comparative evaluation is in order.

The Laumas specification, due to its low explanatory power, is not dependable. The a priori doubt that we had about

a basically macroeconomic specification explaining disaggregated profit rate is confirmed. Moreover, comparing his earlier shifting estimates and the present ones, we find that in the original estimation Laumas found very high degree of shifting in all cases. In the present estimation, there is significant positive coefficient of Z_t in only one case, that of Y^B (total base) equation for the iron and steel industry. The coefficient, however, is only 0.2363. Thus, the stability of the specification, and the stability of the degree of shifting calculated from that are both suspect. The re-runs have not been checked for autocorrelation, because at this stage, our purpose is to eliminate the obvious disqualifiers. The check for autocorrelation comes in a later stage. The Laumas specification, without testing for autocorrelation, can be disqualified on the other grounds.

Out of the remaining two, it is quite difficult to choose one for further experimentation. A question that can arise here is the reason for choosing one. One could use Gandhi specification for the industries where it worked comparatively better, in terms of the criteria of explanatory power, stability of the coefficients, standard errors, etc., and the Rao specification for the rest. By that reasoning, we ought to use Rao specification for tea plantations and Iron and steel industry, and Gandhi specification for the rest.

However, although we are analysing seven industries only, the method of analysis should be applicable to all

industries for which data is available. Deciding on the specification for each industry separately is a procedure which is not tenable according to the implicit assumptions of both these authors. The fact that they use the same specification for all the industries analysed means that they consider the specification to be perfectly general, applicable to different industries in varying degrees only. Keeping in view the implicit claim to generality, a choice has to be made, because doing otherwise would imply existence of two general specifications, which would mean that they are not general but industry-specific. The logical extension of this argument would then be that there could be different specifications for each industry with different explanatory variables, which raises innumerable other problems. The most serious of these would be the implication that there cannot be a general theory of profit, if different explanatory variables are needed to explain profit rates in different industries. Since we accept the assumption that there can be a general specification of profit rate for different industries, we have to make a choice.

Before making a choice, it is to be noted that between the two specifications given by Gandhi and Rao for disaggregated analysis, there is only one substantial difference as far as the non-tax explanatory variables are concerned. The two cost variables, CP_T (cost of production/value of productions) used by Rao and CG_c , used by Gandhi, are not very different from each other. The difference between the

numerators is that of non-operating expenses and the difference between the denominators is that of non-operating income only. The CT_t variable used by both is identical. The difference is only in using V_t (Rao) or CS_t (Gandhi). In both cases, they are insignificant in quite a few equations. However, taking only Y^S (both equity and total base) equations using Z , CS_t has turned out to be significant more often and its standard errors are generally lower. This is one point in favour of the Gandhi specification, keeping aside the question of the proper tax rate variable for the time being. The \bar{R}^2 s are also higher more often in the case of Gandhi specification. Since we can compare the re-run of Gandhi specification with the original estimation for one industry—aluminium—only (no other industry selected by us was analysed by Gandhi), the stability of the coefficient of the tax variable cannot be checked. In that lone case, however, the coefficients estimated by him and by the present estimation are similar. In case of the Rao specification, out of the seven industries, in only two out of 14 cases the coefficient of Z_{t-1} is similar to the original estimation, and the coefficient of L_{t-1} is similar in two out of 14 cases.¹²

Thus, it is the Gandhi specification which is used for

12 The similar coefficients for Z_{t-1} were in Y^S (total base) equations in sugar and cement industries, whereas those for L_{t-1} are for Y^S (total base) equations in iron and steel and cement industries.

further experimentation. But it only means that we prefer CS_t to V_t as an explanatory variable in the profit functions to be estimated. The choice of tax rate, or the question of lag in the tax rate variable is kept open.

No shifting measure is used, nor is any attempt made here to calculate the degree of shifting from these equations. This is because, as it was pointed out earlier, these re-runs were done only for the purpose of checking the performance of the three specifications and to choose one of them for further experimentation, after which an attempt to measure shifting will be made.

CHAPTER 5

A SUGGESTED METHOD FOR ESTIMATING THE DEGREE OF SHIFTING

It was stated earlier that until now, all the Indian studies on the present problem have concentrated their attention on the financial variables. There is quite a possibility, which is well-supported by several theoretical and empirical studies, that even non-financial variables like concentration and capacity utilisation in the industry would have an effect on the rate of return.¹ We take up a discussion about the usefulness of these variables in explaining profit rates and estimating degrees of shifting in the selected industries in this chapter. Next, the shifting results arrived at using two definitions of the tax rate— Z_t and L_t —are compared and a choice made. To do this, L_t had to be used in the estimations, which created the problems of inconsistency because $E(L_t U_t) \neq 0$. Hence, a method had to be devised to use L_t without getting into these problems.

5.1 Incorporation of Non-Financial Variables

As mentioned in Section 4.3.1 of the preceding chapter, our aim was to refine the estimated degrees of shifting by introducing some non-financial variables and improving the

1 Refer to the critique of the K-M study in Chapter 3.

specification for various industries. The best way of determining shifting would be to specify a complete simultaneous equation model covering all variables which could possibly be endogenous² and calculate the degree of shifting from such an exercise. But this involves enormous amount of data and resultant calculation. Due to various constraints, it was impossible for us to contemplate such an analysis for more than one or two industries. Making a choice between a really in-depth study of only one or two industries and a less detailed study of a few industries became imperative. The latter was chosen for two reasons. First, given our intention to show varying degrees of shifting in different industries, one or two industries would not have served our purpose. Our interest in disaggregated analysis lies in our intention and that is prompted by the desire to point out the inapplicability of a broadly general corporate tax policy oblivious to the shifting and resultant effects. Second, our purpose of using the non-financial variables is not to explain the behaviour of the industry as a whole, but to check its effect on shifting estimates only.

Since there have been charges that omission of certain variables tend to over-estimate shifting, we try to see whether inclusion of such variables in the specification improves the explanatory power and causes large changes in the degree of

2 Moffat, op.cit., could be cited as an example.

shifting. So, in a sense, we are trying to find out the marginal contribution of a few non-financial variables, given the financial variables. Actually, the financial variables have a real component and a money component whereas the non-financial variables do not contain the latter. Since our dependent variable is a financial variable, it is but natural that the attempt to explain it starts with financial variables and the non-financial variables are added on later.

Once the Gandhi specification was chosen for further experiments, tests for autocorrelation in the residuals were undertaken. The usual Durbin-Watson statistics were computed and none of them confirmed autocorrelation, except those for iron and steel industry which confirmed positive autocorrelation. In the sugar industry, Y^S (total base) and Y^n equations had D-W statistics ruling out autocorrelation. In all other cases, the D-W statistic was in the indecisive range. The presence of positive first-order serial correlation in case of iron and steel could have been due to incorrect specification, and this was an added reason to introduce the new variables.

The values of the non-financial variables used are given in Appendix Table D. In finding these variables, the reverse of the usual procedure (of first deciding on the useful variables and then using those for which data is available) was adopted. We explored the data availability in each case, and given the availability, decided which could be used in explaining the profit rates. This was certainly a peculiar

procedure, but due to the lack of proper data, this was the most practical. Hence, the variables to be added on to the selected specification were decided separately for each industry. The results are reported in Table 5.1.

For tea plantations, the only new variable used was per acre yield which should have an obvious direct effect on the profit rates. The introduction of this variable did improve the fit, the R^2 and \bar{R}^2 going up from 0.8960 and 0.8683 to 0.9198 and 0.8912 respectively. But the mathematical sign of the coefficient of the new variable was negative instead of positive. This was difficult to accept. Productivity can have a negative effect on rates of return only when the marginal revenue products of the factors of production are not enough to cover the marginal costs. This would come about if there was a buyers' market for tea. The additional production would push the price so low that costs may not be covered. But in that case, the tea plantation owners will not incur the marginal costs to raise output at all, because they will certainly be aware that the market will not 'take' the additional output profitably for them. The above explanation can be valid only if the tea plantations were not aware of the market situation, which is difficult to believe for tea plantations in general. However, this may be so for smaller plantations, which are generally speaking not included in the sample companies. But the per acre yield figures refer to all tea plantations including the small ones. If the smaller tea plantations were responsible for the increased productivity,

Table 5.1 : Regression Results with One/Two Variables Added to the Gandhi Specification for the Chosen Industries

Industry	No. of observations	Dependent variable	Regression Coefficients: (t-values in parentheses)							R ²	\bar{R}^2	D-W Statistic
			Constant	Z _t	CS _t	CG _t	CU _t	CT _t	CR _t /E _t [®]			
1. Tea Plantations	20	PBT/NW	2.1005* (5.4065)	0.0813 (0.7159)	-0.7222* (-2.2305)	-1.4320* (-7.9663)		0.1591* (7.7363)	-0.2591* (-2.0384)	0.9198	0.8912	1.8657
2. Tea Plantations	20	PAT/NW	1.0571* (8.0392)	-0.1281* (-3.3310)	-0.3389* (-3.0928)	-0.6224* (-10.2292)		0.0743* (10.6646)	-0.1440* (-3.3471)	0.9593	0.9447	1.8937
3. Tea Plantations	20	GP/KE	1.6497* (4.4584)	0.0828 (0.7650)	-0.3598 (-1.1668)	-1.4196* (-8.2918)		0.1632* (8.3306)	-0.1753 (-1.4481)	0.9306	0.9058	1.8324
4. Sugar	20	PBT/NW	4.1062* (4.0079)	0.1047 (0.6581)	-0.5052* (-2.3336)	-3.1574* (-4.4489)	-0.2105 (-0.6345)	0.0726* (2.9620)	-8.5108 (-1.2877)	0.7579	0.6461	1.6201
5. Sugar	20	PAT/NW	2.0160* (4.1274)	-0.1082 (-1.4527)	-0.2157* (-2.0899)	-1.4565* (-4.3045)	-0.1744 (-1.1024)	0.0331* (2.8337)	-4.1681 (-1.3227)	0.8468	0.7761	1.7938
6. Sugar	20	GP/KE	2.4959* (4.4831)	-0.0585 (-0.6761)	-0.0736 (-0.6260)	-2.1486* (-5.5712)	-0.1327 (-0.7361)	0.1244* (9.3435)	-5.2518 (-1.4622)	0.9224	0.8866	1.8948
7. Cotton Textiles	20	PBT/NW	2.9609* (4.4510)	-0.0075 (0.1898)	-0.2489* (-3.4899)	-2.5961* (-4.9027)	-0.2164 (-0.6139)	-0.0334 (-1.5002)		0.8729	0.8275	1.2670
8. Cotton Textiles	20	PAT/NW	2.2527* (4.6168)	-0.0188 (-0.6525)	-0.2001* (-3.8260)	-1.8925* (-4.8725)	-0.3103 (-1.2002)	-0.0190 (-1.1621)		0.8783	0.8348	1.2270
9. Cotton Textiles	20	GP/KE	1.9016* (6.5127)	-0.0207* (-1.1990)	-0.1097* (-3.5055)	-1.8623* (-8.0127)	-0.0598 (-0.3865)	0.0468* (4.7805)		0.9499	0.9320	1.7346
10. Iron and Steel	19	PBT/NW	0.8456* (6.0134)	0.1543* (2.4970)	-0.1373 (-1.3619)	-1.0625* (-6.5467)	0.0494* (2.1990)	0.2162* (4.4026)	-0.1354* (-4.1904)	0.9427	0.9141	1.7692
11. Iron and Steel	19	PAT/NW	0.5976* (6.7815)	-0.0452 (-1.1669)	-0.0675 (-1.0682)	-0.6896* (-6.7801)	0.0241 (1.7112)	0.1305* (4.2416)	-0.0793* (-3.9170)	0.9498	0.9248	1.7255
12. Iron and Steel	19	GP/KE	0.5592* (5.1286)	0.0965* (2.0134)	-0.0769 (-0.9831)	-0.7695* (-6.1150)	0.0347* (1.9885)	0.2335* (6.1318)	-0.0907* (-3.6208)	0.9458	0.9187	1.7285

[®] For tea plantations, E_t refers to per acre yield in tonnes. For Sugar, it represents sugar extraction. CR_t stands for share of public sector.

* Significant at 95% confidence level.

(continued)

Table 5.1 : (continued)

Industry	No. of observations	Dependent variable	Regression Coefficients: (t-values in parentheses)							R ²	R ²	D-W Statistic
			Constant	Z _t	CS _t	CG _t	CU _t	CT _t	CR _t [⊙]			
13. Aluminium	19	PBT/NW	0.2730* (2.5304)	0.2107 (0.9724)	-0.2293* (-2.6747)	-1.1013* (-12.6078)	0.0827* (2.0933)	0.1457* (2.1332)	0.7378* (5.4492)	0.9518	0.9277	1.9139
14. Aluminium	19	PAT/NW	0.1998* (1.8045)	-0.1355* (-6.0923)	-0.1435 (-1.6315)	-0.6147* (-6.8573)	0.0722 (1.7805)	0.0509 (0.7265)	0.4494* (3.2341)	0.9186	0.8779	1.6421
15. Aluminium	19	GP/KE	0.1689* (1.7882)	0.0165 (0.8721)	-0.0419 (-0.5586)	-0.7975* (-10.4255)	0.0630* (1.8210)	0.0794 (1.3285)	0.5171* (4.3613)	0.9222	0.8834	1.9362
16. Paper	20	PBT/NW	0.8673* (3.8342)	0.0957 (1.5532)	0.0483 (0.6263)	-1.5269* (-7.3959)	0.1983 (1.4822)	0.2405* (6.6774)		0.9649	0.9523	1.5775
17. Paper	20	PAT/NW	0.5210* (4.3608)	-0.1248* (-3.8333)	0.0758* (1.8594)	-0.8954* (-8.2116)	0.1482* (2.0974)	0.1357* (7.1318)		0.9728	0.9630	1.8214
18. Paper	20	GP/KE	0.7193* (3.8020)	0.0901 (1.7490)	-0.0847 (-1.3124)	-1.1411* (-6.6087)	0.1421 (1.2696)	0.2409* (7.9979)		0.9659	0.9537	1.2856
19. Cement	19	PBT/NW	1.4818* (8.5525)	-0.0061* (-1.7927)	-0.2151* (-3.4324)	-1.7174* (-11.3737)	0.0730 (0.7628)	0.1541* (9.1706)		0.9710	0.9598	1.6664
20. Cement	19	PAT/NW	1.0948* (7.5593)	-0.0101* (-3.5526)	-0.2366* (4.5167)	-1.1034* (-8.7422)	0.0248 (0.3099)	0.0725* (5.1580)		0.9573	0.9408	2.8327
21. Cement	19	GP/KE	1.1093* (8.9272)	-0.0059* (-2.3932)	-0.1104* (-2.4552)	-1.3970* (-12.9003)	0.0786 (1.1454)	0.1828* (15.1677)		0.9815	0.9744	1.7226

* Significant at 95% confidence level.

⊙ CR_t stands for concentration ratio.

supply would be higher. Given the buyers' market, particularly abroad, it would depress profit rates for all. In that case, productivity figures for the relevant sector only would either be insignificant or have a positive sign. But data for the relevant sector only was not available, causing uncertainty as to the propriety of using the per acre yield figure that we have. Finally, it was decided to drop this variable, despite it being significant, for the purpose of further estimations due to this uncertainty.

For the sugar industry, the additional variables used were sugar extraction ratio, i.e. total sugar production as a ratio of total cane crushed, and capacity utilization. Neither of them was significant, and the introduction of these variables actually reduced the \bar{R}^2 from 0.6495 to 0.6461. Hence, it was decided to use the original Gandhi formulation for the final estimations.

In cotton textiles, the additional variable was capacity utilization and because it turned out to be insignificant and also lowered \bar{R}^2 , it was dropped for the purpose of final estimations.³

In case of aluminium, however, the results were quite different. Two additional variables were used—capacity utilization and concentration ratio.⁴ Both the variables

3 A t-value of less than unity for the coefficient of the new variable is certain to lower the value of \bar{R}^2 ; otherwise even if it is insignificant, it may raise \bar{R}^2 .

4 The concentration ratio used is the share of two largest firms in the total output of the industry.

turned out to be significant and the mathematical signs of the coefficients were both positive, as expected. The increases in R^2 and \bar{R}^2 were quite substantial. Addition of these two variables clearly improved the specification and so they were included in the final estimations.

The two additional variables used in estimating the profit equations for the iron and steel industry were capacity utilization and share of public sector in the total production. The first was expected to have a positive effect on profit rates for obvious reasons. The second should have a negative effect on the profit rates (which relates to only private firms) because the private sector has continued to have only two firms, and the public sector would be reducing their market power. Both these variables turned out to be significant and the mathematical signs of the coefficients were as expected. The R^2 and \bar{R}^2 were raised substantially from 0.8540 and 0.8123 to 0.9427 and 0.9141 respectively. What is more, the earlier D-W statistic was smaller than the lower limit value tabulated indicating positive first-order serial correlation. The new D-W statistic moved up into the indecisive range, thus eliminating the certainty of autocorrelation. For these reasons, the new specification was used in the final estimations.

In the cement industry, only capacity utilization could be used as an additional variable. Even that was statistically insignificant and its introduction lowered \bar{R}^2

from 0.9610 to 0.9598. The original specification was therefore retained for the final estimations.

In the paper industry, the situation was slightly different. Again, the only additional variable used was capacity utilization which turned out to be statistically insignificant. However, its incorporation did raise the R^2 and \bar{R}^2 both, from 0.9593 and 0.9485 to 0.9649 and 0.9523 respectively. Besides, there was no noticeable effect on the standard errors of the coefficients of the variables used in both the rounds. Hence, it was decided that though it was statistically insignificant, it did improve the function marginally. Hence the new specification was accepted for the final round of estimations to calculate the degree of shifting.

Our foregoing discussion on the usefulness or otherwise of the new variables, is focused on the Y^E (equity base) equations. However, we have estimated and given the results for other definitions of profit rate— Y^T (total base) and Y^N —also. We did not mention results pertaining to these in our discussion above only to avoid unnecessary repetition. It can be easily checked that all our observations made above with respect to Y^E (equity base) only apply to the other two as well, and these results also support the decisions (about including or excluding the additional variables) made above. For example, our decision to retain the capacity utilization variable in the paper industry despite it being insignificant is supported by the Y^N equation where it is statistically significant.

5.2 The Tax Rate Question

We have earlier touched this problem in the preceding chapter. We have already seen that we have only two alternatives: either Z_t or L_t has to be used. Other tax rates could be the statutory tax rate and the tax liability rate. Statutory tax rate will not serve our purpose simply because it will not reflect the industrywise differences in the actual tax rates. The tax liability rate—calculated as the ratio of tax liability and assessed income as reported in the All-India Income Tax Statistics—could not be used because it was not available at a sufficiently disaggregated level. Moreover, it would still not reflect a part of the industrywise differences in tax treatment. The assessed income figure shown is after all the deductions and allowances in the tax base, i.e., corporate profits, are made. Thus, an important part of the discretionary tax treatment is ignored by adopting such a tax rate. Thus, our choice again narrows down to Z_t and L_t .

Many of the earlier authors have played it safe and used both Z_t and L_t .⁵ In most cases, they led to the same conclusion not necessitating a choice. Gandhi, however, preferred Z_t over L_t , though no rationale was given. As we have noted earlier, use of these two tax rates implies testing of two different hypotheses about the relevance of each one of them in business decisions. There is no strong a priori reason

⁵ K-M explicitly stated that they preferred Model A, i.e., L_t , although they used Z_t (Model B) also.

to prefer one over the other. We take the usual approach of using both of them in our estimations and compare the results. If they are similar, there is no need to prefer one over the other. Only if the results differ, we would be forced to make a choice.

So far as Z_c is concerned, we already have our final equation using it. Some of the preferred equations are contained in Table 5.1 and the others in Table 4.2. Section 5.1 describes the preferred equations and why they were preferred. The coefficients of Z_c in the preferred Y^E (equity base) equations, which will be used in calculating the degree of shifting, are tabulated below.

Table 5.2 : Coefficients of Z_c in the Preferred Equations

Industry	Coefficient	(t-value)
Tea Plantations	0.0911	(0.7296)
Sugar	0.0910	(0.6452)
Cotton Textiles	-0.0139	(0.3738)
Aluminium	0.2107	(0.9724)
Iron and Steel	0.1543*	(2.4970)
Paper	-0.0957	(1.5530)
Cement	-0.0066*	(2.0084)

* Significant at 5% level of significance.

The calculations for the summary measures of shifting are done later in the present chapter.

5.3 Problems of Using L_c and the Solution

The other alternative, L_c , presents us with a dilemma.

As already noted, $E(L_t U_t) \neq 0$, violating one assumption of OLS, and therefore use of L_t as an independent variable is likely to cause inconsistency in the coefficients. On the other hand, using instrumental variable technique following K-M is also rendered improper due to the fact that in the Indian case Z_t does not fulfil the requirements of a good instrumental variable, and there is no other variable which could possibly be used as an instrument for L_t . However, there may be a way out of this dilemma.

Using L_t and Y_t^E (equity base), the function to be estimated is

$$Y_t^E = a_0 + a_1 L_t + a_2 X_{1t} + a_3 X_{2t} + \dots + a_{n+1} X_{nt} + U_t \dots (5.1)$$

where X_{1t} s are the explanatory variables other than the tax rate. Taking $a_1 L_t$ to the left hand side,

$$Y_t^E - a_1 L_t = a_0 + a_2 X_{1t} + a_3 X_{2t} + \dots + a_{n+1} X_{nt} + U_t \dots (5.2)$$

This means that we transform the dependent variable suitably and avoid using L_t as an explanatory variable. However, a priori, we do not know the value of a_1 necessary for the transformation.

This can be derived from the basic process of arriving at the BLUE (best linear unbiased estimate) using OLS. Essentially, the coefficients of explanatory variables are chosen in such a way as to minimize the sum of squared residuals. The maximum likelihood method also yields the same coefficients. This means that the vector of regression coefficients are so

chosen that the explained sum of squares are maximum possible, given the variables included in the function. In other words, the OLS method maximizes the multiple correlation coefficient also, and any change in the vector of regression coefficients would reduce R^2 .

If L_t was allowed to be used as an explanatory variable, a_1 would have been, therefore, calculated so as to maximize the R^2 , just like all the other a_1 s. Even if we shift it to the left hand side, we can still apply the same logic because the equations (5.1) and (5.2) are identical. Therefore, that a_1 which maximizes the R^2 should be chosen as the one best approximating the BLUE.

Once we realize this, the actual estimation procedure becomes quite simple. Different values to a_1 are to be assigned, Y_t^E transformed accordingly, and then equation (5.2) is to be estimated with these different sets of Y_t^E with only the non-tax explanatory variables. That value of a_1 which maximizes R^2 is to be taken as the coefficient of L_t .

The only thing that remains to be decided is the set of possible values to be tried for a_1 . One could take a very fine grid and try values of a_1 at an interval of 0.01 or still less. However, assuming the trial range of a_1 between 0 and 1, a 0.01 interval would require one hundred and one iterations per equation. The smaller the interval, the greater the number of iterations will be. After due deliberation, we decided to use an interval of 0.5, starting from the value zero for a_1 .

Twenty-one iterations would then cover the range of values zero to one for a_1 .⁶ This would mean that our results would be somewhat inexact; supposing a value of 0.25 for a_1 maximizes R^2 in such an estimation, the exact value would be somewhere between 0.2 and 0.3. But for our purpose, such an approximation may be acceptable.

This technique was tried on Y^E (equity base) only, meaning that we measure shifting in terms of Y^E (equity base) index. The primary reason, of course, was to minimize computational burden. It is obvious that our procedure entails estimation of twenty-one (minimum) regressions per industry with only one profit rate, because each iteration implies estimating a new regression. For the seven selected industries, it implies 147 estimations at the minimum. Alternative profit rates would have multiplied this number by the number of alternatives. Even with the help of a computer this becomes quite burdensome and costly.

As we have seen, the use of Y^E (equity base) or Y^N amount to the same thing, because the degree of shifting arrived at is the same. And Y^E (equity base) was preferred to Y^G (total base) for the reason that, as an index of shifting, the former is more directly relevant than the latter due to the non-taxable portion (interest payments) in the gross profits.

6 Whenever the R^2 -maximizing value of a_1 was less than zero or greater than unity, the number of iterations was naturally higher, as in the case of sugar industry.

The results of applying this technique to our data are given in Table 5.3. The non-tax variables used are the same as in the preferred equations described in Section 5.1.

5.4 The Shifting Estimates

The results, as we were inclined to believe, show widely divergent degrees of shifting. Since coefficients of L_t directly give us the degrees of shifting, one can immediately read from Table 5.3 that shifting varies from 110 per cent to only 5 per cent.

But the estimates are point estimates without any standard error due to the technique adopted. Consequently, they cannot be tested by the usual t-test. It is not wise to put too much faith in point estimates, and more so in our case because of the approximation that our technique involves. Naturally, it would be highly desirable to test the coefficient of L_t and/or have a confidence interval for it, either directly using the estimate of the coefficient or by using the other summary statistics like R^2 , or F-value, or residual sum of squares, etc. But despite our best efforts, a test suited to our requirements could not be found. Hence, we have to be satisfied with the point estimates and the hope that the confidence intervals for the coefficients of L_t will not be too large to nullify our conclusions about degree of shifting.

At this point, shifting estimates arrived at by using Z_t in the profit equation should also be given. For a proper comparison, only shifting in terms of Y^E (equity base) is given below with shifting estimates obtained by using L_t . We

Table 5.3 : Results of the Iterative Regressions for Y^E (Equity Base)

Industry	Coeff- icient of L_t	Regression coefficients of: (t-values in parentheses)						R^2	\bar{R}^2
		Constant	CS_t	CG_t	CT_t	CU_t	E_t [⊗]		
Tea Plantations	0.70	0.9575	-0.1631 (-1.1604)	-0.9495* (-9.9197)	0.0778* (9.1289)			0.9083	0.8911
Sugar	1.10	1.7922	-0.3226* (-4.6833)	-1.7000* (-7.9476)	0.0400* (3.4816)			0.8059	0.7695
Cotton Textiles	0.10	2.6682	-0.2327* (-4.5255)	-2.4653* (-8.8143)	-0.0351* (-1.7544)			0.8683	0.8436
Iron and Steel	0.85	0.6403	-0.0890* (-1.5064)	-0.7457* (-7.0324)	0.1416* (4.4621)	0.0284* (1.9412)	-0.0899* (-4.4362)	0.9474	0.9272
Aluminium	0.10	0.2688	-0.2191* (-2.7461)	-1.0566* (-13.1764)	0.1385* (2.1930)	0.0790* (2.2222)	0.7097* (5.6179)	0.9506	0.9316
Paper	0.50	0.6479	0.0491 (1.2592)	-1.2091* (-8.2722)	0.1912* (8.0834)	0.1947* (2.7896)		0.9691	0.9608
Cement	0.05	1.7305	-0.2402* (-4.9119)	-1.9194* (-17.0205)	0.1490* (9.9305)			0.9611	0.9533

⊗ E_t refers to two-firm concentration ratio (output) in case of aluminium and share of public sector in total output in case of iron and steel industry.

* Significant at 95% level of significance (constant terms not considered).

have shown in the previous chapter (Section 4.1.2) that the degree of shifting is equivalent to the coefficient of L_t when L_t is used and equal to the coefficient of Z_t divided by Y^E (equity base) when Z_t is used. In the latter case, degree of shifting varies from year to year with variations in Y^E . Since variations in Y^E are not very high generally, the degree of shifting can be approximated by the coefficient of Z_t divided by the average gross profit rate (equity base). It follows that the two shifting measures then are more or less comparable since the definition and consequent measure of shifting is the same in both cases.

Table 5.4 : Shifting Estimates Using L_t and Z_t

Industry	Degree of Shifting (%)	
	Using L_t	Using Z_t
Tea Plantations	70	0
Sugar	110	0
Cotton Textiles	10	0
Iron and Steel	85	109
Aluminium	10	0
Paper	50	0
Cement	5	-5

In calculating the degree of shifting using Z_t , those coefficients of it which are insignificant statistically are taken to be zero and the resultant degree of shifting is also taken as zero. If we ignore tests of significance, going ahead with our calculations of shifting using the estimated

values of the coefficients of Z_t , the degrees of shifting will be 58, 50, -11, 109, 120, -61 and -5 per cent in the order given in the above Table. However, ignoring tests of significance cannot be a sound step, and therefore the estimates given in Table 5.4 are the ones to be taken into account. It can be immediately seen that in three industries (tea plantations, sugar and paper) shifting estimates using L_t and Z_t vary considerably. In other cases, the differences are not very high. Even in iron and steel industry, the difference is that of 24 percentage points, but at least we could conclude that the degree of shifting is fairly high in iron and steel industry, and leave it at that. But in the above-mentioned three industries, the degrees of shifting are so different that we have to choose one of them. In other words, we are forced to make a choice between model A (using L_t) and model B (using Z_t) outlined in the preceding chapter.

Model A, that is the tax rate L_t , is preferred here. This is because it is more probable that the corporations would consider shifting in terms of the tax rate per unit of capital than in terms of the effective tax rate. The profit rates are generally calculated in terms of capital, and the difference between Y^E (equity base) and Y^N would normally be considered the tax rate, which happens to be L_t . K-M also prefer this formulation for the same reason. However, it can still be noted in passing that even the degrees of shifting estimated by using Z_t show a wide variation, between -5 per cent and 109 per cent.

5.5 The First-Difference Equations

The equation estimated in model A was:

$$Y_t^E = a_0 + a_1 L_t + a_2 X_{1t} + a_3 X_{2t} + \dots + a_{n+1} X_{nt} + U_t \quad \dots (5.1)$$

Lagging it by a year:

$$Y_{t-1}^E = a_0 + a_1 L_{t-1} + a_2 X_{1,t-1} + a_3 X_{2,t-1} \\ + \dots + a_{n+1} X_{n,t-1} + U_{t-1} \quad \dots (5.2)$$

Deducting (5.2) from (5.1):

$$\Delta Y_t^E = a_1 \Delta L_t + a_2 \Delta X_{1t} + a_3 \Delta X_{2t} + \dots + a_{n+1} \Delta X_{nt} + \Delta U_t \quad (5.3)$$

where the X_i s are explanatory variables and Δ signifies the first differences.

What (5.3) shows is that if the equation (5.1) is properly estimated, equation (5.3) is also proper. That means, equation (5.3) can be estimated as a check on equation (5.1). It is to be noticed that while all the regression coefficients in (5.1) and (5.3) are the same, a_0 (the intercept) 'vanishes'. This will be so if the specification is 'complete', i.e., exactly the same as the 'true' relationship. But the latter is unknown and hence any specification attempted will only be an approximation of the 'true' relationship. Naturally, the a_0 term may not be completely absent, nor may the other a_i s be the same. However, as long as the intercept is very small and the other coefficients in the estimation of (5.3) are near the values of those coefficients in (5.1), the specification can be said to be fairly accurate.

To run a check on the iterative regression results

Table 5.5 : Results of the Iterative Regressions in First-Difference Form

Industry	Coeff- icient of L_t	Regression coefficient of: (t-values in parentheses)						R^2	\bar{R}^2
		Constant	ΔCS_t	ΔCG_t	ΔCT_t	ΔCU_t	ΔE_t @		
Tea Plantations	0.70	-0.0053	-0.8372* (-2.8995)	-0.8079* (-11.8879)	0.1099* (7.5846)			0.9280	0.9136
Sugar	0.75	0.0057	-0.0454 (-0.2764)	-1.9378* (-7.6050)	0.0159 (0.5646)			0.8209	0.7851
Cotton Textiles	0.35	0.0077	0.1454 (0.6159)	-2.3875* (-10.8986)	-0.0370 (-0.9370)			0.8953	0.8744
Iron and Steel	0.25	-0.0069	-0.2212* (-1.8516)	-0.7642* (-2.1068)	0.2517* (3.7906)	0.0117 (0.4644)	0.0243 (0.2023)	0.8465	0.7825
Aluminium	0.10	0.0014	-0.2098* (-2.3510)	-0.9155* (-5.9596)	0.1572* (2.8708)	0.0783 (1.5700)	0.6275* (2.8066)	0.8432	0.7779
Paper	0.40	-0.0023	-0.1494 (-1.2371)	-1.2589* (-8.4003)	0.2358* (4.5802)	0.1574* (2.1900)		0.9387	0.9211
Cement	-0.35	0.0035	-0.1147 (-0.8199)	-1.9172* (-8.5296)	0.1468* (3.6208)			0.8922	0.8691

@ E_t refers to two-firm concentration ratio (output) in case of aluminium and share of public sector in total output in case of iron and steel.

* Significant at 95% level of significance (constant terms not considered).

reported in Table 5.3, we estimated similar regressions in the first-difference form also. The results are reported in Table 5.5.

The degree of shifting was earlier found to be the coefficient of L_t . Since the coefficient of L_t in (5.1) and ΔL_t in (5.3) are the same, the coefficient of ΔL_t in Table 5.5 can straightaway be taken as the degrees of shifting and compared with the earlier estimates obtained.

It can be immediately seen that the shifting estimates⁷ in case of tea plantations and aluminium industries are exactly the same as the earlier estimates. In case of sugar, both the estimates are fairly high, though there is a difference of 35 percentage points. In case of the paper industry the shifting estimates are approximately the same. In case of cotton textiles, the difference is that of 25 percentage points, but both coefficients are positive. Remembering that our shifting estimates are only approximations, we can at least conclude that degree of shifting in cotton textile industry is small.

But in the other two industries, degrees of shifting are substantially—and inexplicably—different from the earlier estimate. The obvious reason is of course misspecification, but we do not know the source of it. For cement

⁷ Our main concern being shifting, we look at the coefficient of L_t and ΔL_t only. It can be easily seen that in some cases the other coefficients are similar, as expected, but in other cases they are not.

industry, as we mentioned earlier, concentration would have perhaps been an important explanatory variable, which could not be used due to data limitations. The omitted variable thus might have caused the difference. Even the mathematical sign changes from positive to negative. The magnitude of difference is that of 40 percentage points. This magnitude is even higher (60 percentage points) in case of iron and steel and in this case we do not have the excuse offered in case of cement. Naturally, the specification error may be either due to the form of specification or lags in the 'true' specification which is not taken into account. The question of lags is important otherwise also, and hence it is taken up in the next chapter.

CHAPTER 6

POSSIBLE LAGS IN THE TAX EFFECT

The hypothesis to be tested in the following discussion is that the effect of the tax rate on the profit rate (i.e. the shifting) may be spread over a few years, in the sense that unlike the usually assumed immediate effect only (implied by the specification containing only the current value of the tax rate), a change in the tax rate may have its effect partly on the same year's profit rate and partly on the profit rates of subsequent years. Unless we take into account lagged values of the tax rate in the profit function, the tax rate coefficient may be misleading because the profit rate will contain effects of earlier tax rates also. Even coefficients of other variables may be incorrectly estimated.

K-M also had wondered about this question. Even after deciding that they would use only the current value of the tax rate, they write: "This, to be sure, does not mean the measured effect occurred altogether in the year of change since tax changes in successive years are correlated."¹ They even make an experiment with a lagged tax rate variable along with the current one, but find the former to be insignificant and drop it from their standard model.²

1 See Krzyzaniak and Musgrave, Shifting of the Corporation Income Tax, op.cit., pp. 29-30.

2 Ibid., pp. 43-44.

Rao uses a lagged tax rate variable instead of a current one and obtains reasonably good results, the lagged tax rate being significant in a few industries. However, as per his hypothesis which states that it is the previous year's tax rate which is shifted (not the current) and the consequent definition of shifting, he is not concerned with the current rate at all. He does not anywhere use the current as well as lagged tax rates together, which would enable one to make a comparison of the empirical significance of the two. A doubt remains that the lagged tax rate might have acted simply as a proxy variable to the current tax rate. Be it as it may, it does indicate the possibility of a lagged effect of the tax rate.

6.1 The General Lag Structure

The general format of the equation to be estimated is:

$$Y_t^E = a_0 + \sum_{i=1}^{n-1} a_i X_{it} + a_n L_t + a_{n+1} L_{t-1} + \dots \quad \dots (6.1)$$

where Y_t^E is the gross profit rate (equity base), X_{it} are non-tax independent variables, and L_t , as explained earlier, denotes tax provision per unit of net worth.

Estimating (6.1) in this form is impracticable since the series of $\sum_{j=0}^{\infty} a_{n+j} L_{t-j}$ could go on upto infinity. Even going a long way back is ruled out due to limited number of observations. Some way must be found out to bring it within manageable limits.

6.2 OLS with a Cut-off Year

Since (6.1) is in the infinite distributed lags form, one way would be to assume that all a_{n+j} after a_q vanish or

are equal to zero. Then (6.1) becomes a finite distributed lags system. Depending on the number of observations and the value of q , it can then be directly estimated.

"There are three problems, however. The first is that the choice of cutoff is somewhat arbitrary, there being generally no theoretical justification for any cutoff chosen. Second—as in the case of an infinite number of lags—there will generally be a multicollinearity problem, since X_t , X_{t-1} (i.e. the lagged independent variables), etc., all tend to move together. The third problem is that of lack of data, since when using time-series data over a given period, each lag included implies the loss of one data point."³

Given these difficulties, it would not be advisable to use this method despite its simplicity. It is simple because we can read off the degrees of shifting straightaway from the estimated equation. Moreover, we have an additional problem. The dilemma related to L_t discussed earlier in section 5.3 of Chapter 5 again crops up if we estimate it as suggested above.

6.2.1 The Trial Estimation

In any case, as a first trial we estimated such an equation for Y_t^E using Z_t . We used only two lagged values of Z_t , Z_{t-1} and Z_{t-2} in addition to Z_t itself. That is, we assumed that the 'spread' of the tax effect is limited to

³ Michael D. Intrilligator, Economic Models, Techniques and Applications, Prentice-Hall, Englewood Cliffs, New Jersey, 1978, p. 173 (words within brackets inserted).

three years, including the current year. This was done only as an initial step to test the hypothesis. The standard Gandhi specification plus two lagged values of the tax rate were used. We could use tax rate data for 1953-54 and 1954-55, enabling us to keep the number of observations constant at 20. This was because unlike some other variables (e.g., sales) the tax provision and profits before tax data were comparable for the earlier period too. However, degrees of freedom do get reduced by two.

The results of these estimations are presented in Table 6.1. It can be immediately seen that except in the iron and steel industry, neither of the lagged tax rates are significant. It may be remembered that we had expressed such a possibility in the earlier chapter for the iron and steel industry.

However, the tax rate coefficients may have been misleading due to multicollinearity. To make a cursory check on that possibility, the simple correlation coefficients between the lagged tax rates and the unlagged one were looked into. These are given in Table 6.2. It shows that except in iron and steel industry and paper industry, multicollinearity is probably absent. Even in these two cases the problem of multicollinearity may not be too severe.

The D-W statistics are all in the inconclusive range (except in the case of iron and steel where it passes the d-test at 1 per cent significance level), not allowing us either to

Table 6.1 : Estimated Y^E (Equity Base) Equations for the Selected Industries with Two Lagged Values of the Tax Rate

Industry	Regression coefficients of: [t-values in parenthesis]							R^2	\bar{R}^2	D-W Statistic
	Constant	Z_t	Z_{t-1}	Z_{t-2}	NW/KE	CGS/S	S/KE			
Tea Plantations	1.4590	0.0448 (0.3509)	-0.1207 (-1.3283)	-0.0385 (-0.4786)	-0.2098 (-0.8259)	-1.4455* (-7.3408)	0.1370* (8.1340)	0.9115	0.8706	1.7872
Sugar	3.1761	0.0714 (0.4739)	0.0490 (0.4761)	-0.0984 (-0.8601)	-0.4714* (-1.8165)	-3.1749* (-4.3301)	0.0949* (3.0811)	0.7412	0.6217	1.5898
Cotton Textiles	3.0151	0.0095 (0.2176)	0.0410 (1.2412)	0.0067 (0.2460)	-0.2778* (-3.7781)	-2.8004* (-5.2558)	-0.0459* (-2.0351)	0.8840	0.8305	1.4049
Iron and Steel	1.4674	0.0423 (0.8117)	-0.0281 (-0.5204)	0.2573* (6.0901)	0.0052 (0.0882)	-1.9063* (-21.5390)	0.1120* (3.8257)	0.9785	0.9678	1.9417 ^a
Aluminium	0.7359	0.0135 (0.2619)	0.0249 (0.5091)	-0.0008 (-0.1037)	-0.3220* (-2.0357)	-0.8715* (-6.0031)	0.3760* (4.2175)	0.8366	0.7549	1.3025
Paper	1.0077	0.0336 (0.5841)	-0.0001 (-0.0018)	0.0024 (0.0409)	0.0995 (1.2458)	-1.4844* (-6.4061)	0.2266* (5.1199)	0.9593	0.9406	1.5170
Cement	1.5109	-0.0081* (-2.3205)	0.0535 (1.4949)	0.0113 (0.3148)	-0.2126* (-3.8768)	-1.7120* (-10.8019)	0.1569* (11.0190)	0.9755	0.9633	1.7952

* - Significant at 5% level of significance (constant terms not considered).

^a - Rejects the hypothesis of first-order serial correlation.

Table 6.2 : Simple Correlation Coefficients of the Tax Rates Used in Table 6.1

Industry	Correlation coefficients between		
	Z_t and Z_{t-1}	Z_t and Z_{t-2}	Z_{t-1} and Z_{t-2}
Tea Plantations	0.1750	0.1699	0.4129
Sugar	0.2948	0.0518	0.3683
Cotton Textiles	0.1901	-0.2625	0.1757
Iron and Steel	0.7462	0.4028	0.7399
Aluminium	0.3655	-0.3381	0.3055
Paper	0.6224	0.3887	0.6696
Cement	0.1147	-0.0499	0.3668

reject or accept the hypothesis of first-order serial correlation among the residuals. However, the encouraging result for one industry—iron and steel—is enough to allow us to proceed for a proper estimation of a distributed lags (of the tax rate) system.

6.3 The Application of Koyck Scheme

One of the simplest distributed lags schemes was proposed by Koyck. Under the Koyck lag structure, the coefficients of the successive lagged values of the independent variable decline geometrically.⁴ More specifically,

$$b_j = \lambda b_{j-1} = \lambda^2 b_{j-2} = \dots = \lambda^j b_0, \text{ for all } j, \quad \dots (6.2)$$

where $0 < \lambda < 1$, and where the 'b's denote the coefficients of the variable with the distributed lags.

⁴ See *ibid.*, p. 180; and J. Johnston, Econometric Methods (2nd edn.), McGraw-Hill Kogakusha, Tokyo, 1972, pp. 298-311.

Equation (6.1) implies that each coefficient is a fixed proportion of the previous one and they continuously decline given the assumption that $|\lambda| < 1$. If during the estimation λ turns out to be zero, it implies that there is no lagged effect and if, on the other hand, it turns out to be near unity, the coefficient declines very slowly.

Our general equation then becomes

$$Y_t^E = a_0 + a_1 X_{1t} + a_2 X_{2t} + a_3 X_{3t} + \dots + b_0 L_t + b_0 \lambda L_{t-1} + b_0 \lambda^2 L_{t-2} + \dots + U_t \quad \dots (6.3)$$

Lagging by one period and multiplying by λ ,

$$\lambda Y_{t-1}^E = \lambda a_0 + \lambda a_1 X_{1,t-1} + \lambda a_2 X_{2,t-2} + \dots + b_0 \lambda L_{t-1} + b_0 \lambda^2 L_{t-2} + \dots + \lambda U_{t-1} \quad \dots (6.4)$$

Subtracting (6.4) from (6.3),

$$Y_t^E - \lambda Y_{t-1}^E = a_0(1-\lambda) + a_1(X_{1t} - \lambda X_{1,t-1}) + a_2(X_{2t} - \lambda X_{2,t-1}) + b_0 L_t + (U_t - \lambda U_{t-1}) \quad \dots (6.5)$$

Taking $b_0 L_t$ to the left hand side,

$$Y_t^E - \lambda Y_{t-1}^E - b_0 L_t = a_0(1-\lambda) + a_1(X_{1t} - \lambda X_{1,t-1}) + a_2(X_{2t} - \lambda X_{2,t-1}) + \dots + (U_t - \lambda U_{t-1}) \quad \dots (6.6)$$

This is the equation to be adopted.

It is the same type of equation as estimated in the preceding chapter (Section 5.3), with two major differences.

In the earlier case we had only one coefficient which

was assigned different values by the iterative procedure. In this case, there is an additional constant, λ , on which iterations have to be done. Moreover, unlike the earlier case, depending on the value of λ assigned, all the variables—dependent as well as independent—except L_t have to be suitably transformed using their current as well as lagged values. Therefore, we have one observation less than earlier in estimating the regression.

Even the error term is transformed, but the transformed error term also is normally distributed with zero mean and constant variance.⁵ Hence, OLS will still give maximum-likelihood estimators. Keeping Y_{t-1}^E on the right hand side as an independent variable would have caused biased estimates because it will not be independent of the error term. Taking it to the left-hand side eliminates this problem. Moreover, keeping λY_{t-1}^E on the right-hand side would have created an impasse, because λ would be estimated by the regression on the one hand as the coefficient of Y_{t-1}^E , and on the other hand, we would need λ before the estimation to transform the non-tax independent variables. Our problems would have been simpler if we had only the variable to which distributed lags are being applied to as the independent variable. But our function has

5 Given that U_t (and so U_{t-1}) follow a normal distribution with zero mean and a variance of σ^2 , it can be easily shown that $(U_t - \lambda U_{t-1})$ will follow normal distribution with zero mean and a variance of $\sigma^2(1 + \lambda^2)$, provided there is no serial correlation.

other variables, to which the distributed lags do not apply, which somewhat complicates the picture.⁶ In any case, (6.6) is the equation we estimate using different combinations of values for λ and b_0 . As earlier, we confine ourselves to the range 0 to 1. In case of λ , that is the range, because by assumption λ cannot be negative or greater than one. It can be argued that λ may be negative as long as its absolute value remains below unity. This would imply that the successive lagged values of L_t have coefficients taking a positive and a negative value alternately (λ^i would be positive when i is even and negative when i takes an odd value), which eventually damp out. It may just be possible, but seems unlikely.

For b_0 , we start with the aforementioned range, but if necessary, values greater than unity or less than zero are considered too.

The intervals had to be decided again, because there being two values to be assigned, the number of iterations would be higher. If we had adopted a .05 level as earlier for both values, there would have been (21 x 21) 441 iterations necessary for each industry. This was clearly too big a task. The number of iterations had to be brought within manageable limits

⁶ With L_t as the only independent variable, (6.5) reduces to
$$Y_t^E = a_0(1 - \lambda) + b_0 L_t + \lambda Y_{t-1}^E + (U_t - \lambda U_{t-1}).$$
 If L_t and Y_{t-1}^E satisfy the conditions of an independent variable then OLS can be straightaway applied, yielding b_0 as well as λ . There are, of course, problems in this apparently simple estimation, which need not be gone into here.

and at the same time the intervals could not be kept too large.

It was finally decided to conduct the iterations in two stages. In the first stage, an interval of 0.2 was used for both the coefficients and the number of iterations for each industry was (6 x 6) 36. However, if the maximum R^2 was reached with a value of $b_0 = 0$ or 1, then the iterations were continued for values of $b_0 < 0$ or > 1 until the R^2 started falling. Therefore, sometimes the number of iterations went beyond 36. Thus, those values of b_0 and λ were reached which maximized the R^2 , given the 0.2 intervals. However, this interval was too large and both the current shifting measure (b_0) and the lag coefficient (λ) would have had too big a range.

To find out more exact values of these two coefficients, the second stage of the iterations was necessary. In this stage, the R^2 maximizing values of the two coefficients arrived at with the first-stage estimations were taken as the initial values⁷ and a finer grid of values around each of them were explored to find out the values which would maximize the R^2 . For values of b_0 , an interval of 0.05 was adopted in this stage, in line with the results of the earlier chapter and for values

⁷ In some cases, particularly for the iron and steel industry, different combinations of values for b_0 and λ yielded R^2 s which were not very different. In such cases, the second stage was applied to all such combinations, to cover the possibility that with further division in the grid, the area of maximum R^2 may be different from the one arrived at after the first stage of computation. Table 6.3, however, does not show this.

of λ , an interval of 0.1 was considered sufficient. Values of λ beyond 1 or less than 0 were not considered at all because such values were ruled out by assumption. To take an example, suppose the initial values of b_0 and λ were 0.6 and 0.2 as arrived at after the first stage. In the second stage we checked the R^2 values with values of b_0 as 0.7, 0.65, 0.6, 0.55 and 0.5. For each of these values of b_0 , there were three iterations on λ , those for the values of 0.3, 0.2 and 0.1. Thus, there were 15 iterations per industry, though in some cases they were less, because values of λ less than 0 or greater than one were not considered.

6.4 Results

Table 6.3 gives the results of the first stage of iterations. It can be immediately seen that the degrees of shifting are more or less near the degrees estimated earlier. However, to make a comparison with the earlier results, the results of second-stage estimations are necessary. These are given in Table 6.4. It can now be seen that the degrees of shifting estimated are exactly the same in the case of Aluminium and Paper. It is almost the same in the cases of Tea Plantations and Iron and Steel, the differences being not more than ten percentage points. In case of Cement industry, however, the difference is that of twenty percentage points. All these industries probably shift the tax burden (or whatever fraction of it they do) immediately and there is no lag in the shifting.⁸

⁸ It may be recalled that the preliminary exploration of lags in section 6.2 above had indicated lags in shifting in Iron and Steel industry, but the results here do not show any

(continued)

Table 6.3 : Results which Yielded the Highest Values of R^2 with Different Values Assigned to b_0 and λ during the First Round

Industry	Dependent Variable	Optimum b_0	Optimum λ	Regression coefficients of: [t-values in parentheses]					R^2	
				Constant	(NW/KE) _t	(CGS/S) _t	(S/KE) _t	(Capacity Utilisation) _t		E_t
Tea Plantations	Y_t^G	0.6	0	1.0135	-0.1343 (-0.9361)	-1.0616* (-10.6322)	0.0904* (9.9471)			0.9237
Sugar	do	1.0	0.4	1.2128	-0.2775* (-2.8215)	-2.0782* (-8.9823)	0.0398* (2.4970)			0.8517
Cotton Textiles	do	-0.2	1.0	0.0233	0.2861 (1.0958)	-2.6303* (-10.8580)	-0.0626 (-1.4317)			0.8968
Iron and Steel	do	1.0	0	0.6174	-0.1078* (-1.8384)	-0.6695* (-6.2934)	0.1076* (2.8969)	0.0214 (1.4127)	-0.0734* (-3.0008)	0.9145
Aluminium	do	0.2	0	0.2512	-0.2141* (-2.5834)	-0.9955* (-11.9473)	0.1218* (1.8714)	0.0855* (2.3496)	0.6790* (5.2539)	0.9421
Paper	do	0.4	0	0.6809	0.0501 (1.2546)	-1.1556* (-7.1794)	0.2172* (8.2664)	0.1120 (1.4675)		0.9741
Cement	do	0.2	0	1.7228	-0.2539* (-5.5758)	-1.8836* (-17.3045)	0.1360* (9.7561)			0.9625

θ - E_t refers to concentration ratio for the Aluminium industry and share of public sector for the Iron and Steel industry.

* - Denotes significant at 5% level of significance.

Table 6.4 : Results which Yielded the Highest Values of R^2 with Different Values Assigned to b_0 and λ during the Second Round

Industry	Dependent Variable	Optimum b_0	Optimum λ	Regression coefficients of: t-values in parentheses					R^2	
				Constant	$(NW/KE)_t$	$(CGS/S)_t$	$(S/KE)_t$	Capacity Utilisation		E_t [⊙]
Tea Plantations	Y_t^E	0.65	0	0.9825	-0.1323 (-0.9593)	-1.0258* (-10.6910)	0.0365* (9.9040)			0.9238
Sugar	do	1.0	0.3	1.4064	-0.2983* (-3.4320)	-2.0133* (-9.1731)	0.0379* (2.7722)			0.8535
Cotton Textiles	do	-0.25	1.0	0.0267	0.3058 (1.1657)	-2.6392* (-10.8454)	-0.0658 (-1.4979)			0.8969
Iron and Steel	do	0.95	0	0.6264	-0.1038* (-1.7591)	-0.6892* (-6.4381)	0.1138* (3.0431)	0.0225 (1.4748)	-0.0753* (-3.0567)	0.9151
Aluminium	do	0.1	0	0.2636	-0.2149* (-2.5539)	-1.0524* (-12.4425)	0.1362* (2.0613)	0.0788* (2.1348)	0.7111* (5.4211)	0.9446
Paper	do	0.5	0	0.6215	0.0348 (0.9240)	-1.0995* (-7.2362)	0.2098* (8.4574)	0.1443* (2.0026)		0.9744
Cement	do	0.25	0	1.7092	-0.2573* (-5.7610)	-1.8593* (-17.4139)	0.1316* (9.6194)			0.9627

⊙ - E_t refers to concentration ratio for Aluminium and share of public sector for Iron and Steel industry.

* - Denotes significant at 5% level of significance.

This is indicated by the optimum values (judged by the sole criterion of highest R^2) of λ equal to zero. The other two industries, Sugar and Cotton Textiles, do indicate some lags in the shifting process. But before we go into them, a possible question must be discussed first.

The equation that we estimated to test the hypothesis of lags was

$$Y_t^E - \lambda Y_{t-1}^E - b_0 L_t = a_0(1 - \lambda) + a_1(X_{1t} - \lambda X_{1,t-1}) \\ + a_2(X_{2t} - \lambda X_{2,t-1}) + \dots \\ + (U_t - \lambda U_{t-1}),$$

where X_1 s are the independent variables. The fact to be noted is that, with $\lambda = 0$, the equation reduces to

$$Y_t^E - b_0 L_t = a_0 + a_1 X_{1t} + a_2 X_{2t} + \dots + U_t.$$

This is the equation we estimated (giving different values to b_0) in the preceding chapter. Hence, whenever $\lambda = 0$, the present estimations should tally with the earlier ones. However, as we have seen, out of five cases where optimum value of $\lambda = 0$, only two cases show exactly the same degree of shifting. A legitimate question would be, why the discrepancy? Apparently,

(Footnote 8 from last page continued)

lags. The coefficients of tax rates given in Table 6.1 are of course not to be taken seriously due to the possibility of multicollinearity. But the fact that R^2 with $\lambda = 0$ was not very much higher than R^2 s with $\lambda > 0$ in the present estimation makes our conclusion of no lags in shifting in Iron and Steel a little shaky.

with $\lambda = 0$, both equations are the same and with same sets of data, same results should follow.

But, there is a difference in the two sets of estimations. In the first set, there is no lagged value involved and so, all the available observations can be used. In the second set, one year lagged values are used, and hence the number of observations and degrees of freedom are reduced by one. Even when $\lambda = 0$, this is the case. The first observation on each variable is not used at all.

This, to be sure, is a small difference. However, so are the discrepancies except in the case of cement, where the difference is that of 20 percentage points. The only reason could be that the first observations were extreme values, the exclusion of which alters the line of best fit substantially. Examination of data confirms this.

Taking the sugar industry now, it shows an immediate shifting of 100 per cent (as compared to 110 per cent in the earlier estimation) with a lag coefficient (λ) equal to 0.3. At this point, the interpretation of the lag coefficient and the change in the measure of shifting must be made clear.

The lag coefficient (λ) can be interpreted as the multiple by which degree of shifting gets reduced every successive year as we proceed backwards; this degree of shifting is with reference to current rate of profits only. Thus, $b_0 = 1$ and $\lambda = 0.3$ implies that immediate shifting is 100 per cent, shifting with one-year lag is $(1 \times .30)$ 30 per cent, shifting

with two-year lag is $(.3 \times .3)$ 9 per cent, and so on. The total degree of shifting is given by:

$$\begin{aligned} & b_0 + \lambda b_0 + \lambda^2 b_0 + \lambda^3 b_0 + \dots \\ & = b_0(1 + \lambda + \lambda^2 + \lambda^3 \dots) \\ & = b_0 \frac{1 - \lambda^n}{1 - \lambda} \quad \dots (6.7) \end{aligned}$$

As $n \rightarrow \infty$, $\lambda^n \rightarrow 0$, provided $0 < \lambda < 1$. Then (6.7) reduces to $b_0/(1 - \lambda)$.

Total shifting in sugar industry, then, is:

$$1/(1 - 0.3) = 1/0.7 \approx 1.43 \text{ or } 143 \text{ per cent approximately.}$$

The earlier result, it may be recalled, showed 110 per cent shifting.

The results for the cotton textiles industry show a negative shifting to the tune of 25 per cent. In the earlier set of estimations, the degree of shifting arrived at was 5 per cent. Thus, there is a fall of 30 percentage points in the shifting estimate. However, negative shifting itself is not a very surprising result. In fact, every disaggregated study has at least a few results of negative shifting. There are many who do not attach any importance or even credibility to negative shifting and tend to lump all such results under the head of zero shifting,⁹ but this method is not very sound. This is done on the basis of the assertion that since there is no theory of negative shifting, there cannot be negative shifting; if

⁹ See E. Cary Brown, "Recent Studies of the Incidence of the Corporate Income Tax," op.cit., for such a view.

there is any such result, it should be treated as zero shifting. Actually, there is some theoretical rationale for negative shifting, or in other words, tax avoidance. The Scitovsky-Boulding model and the managers' utility-maximization model, explained in Chapter 2, are examples. As to the credibility of such a result in cotton textiles industry in India, we postpone the discussion to the final chapter.

The more disturbing result is the λ value equal to 1. This just cannot be, because it implies that the current year's rate of tax is shifted at the same degree in the present year as well as all years to come! A value of around unity but less than it was hoped for when the first stage of estimations showed that the optimum value of λ was unity. But even in the second stage, the optimum value for λ was again unity, and what is more, the R^2 showed a definite tendency of increasing as λ approached unity, which means the optimum value of λ as judged by the R^2 criterion might have been greater than unity if we allowed λ to assume a value greater than unity. Since there cannot be any meaningful or rational interpretation of this result, it inevitably follows that there is an error in our technique. There are a few places where the method might have gone wrong. First, the assumption of the Koyck scheme (that shifting, if lagged, falls geometrically over time) may not be valid in this case. If that is so, such a result cannot be ruled out as a freak result. It is a warning.

Actually, this point is applicable probably to our whole analysis of possible lags in shifting. Only one

distributed lags scheme, i.e., the Koyck scheme, was tried in the present study though there are alternatives available, the Almon distributed lag form being the best known of them. The Koyck scheme has the most restrictive assumptions, and because of that, it is the simplest to estimate. However, unless the coefficients of the lagged variables fall geometrically as one lags them more and more, Koyck scheme is not a proper one. Almon scheme is far more flexible and can allow for any shape of the curve representing distributed lag coefficients, depending upon the degree of polynomial chosen.

However, our work suggests that for all industries which we examined except one (viz. cotton textiles) the Koyck scheme serves the purpose adequately. Perhaps for the cotton textiles case, experimentation with Almon lag structure may be necessary. However, we have not attempted it in the present study.

The second place where it could have gone wrong is that there may be an important variable which is omitted. There is hardly any definitive empirical study on profit rates and its determinants. Hence, the possibility of an omitted variable cannot be ruled out. It may be recalled that the one physical variable tried (capacity utilization) did not prove to have significant explanatory powers vis-a-vis the profit rate. But there could be other variables (e.g. restrictions on the industry) which were omitted. Due to all these reasons, we are forced to leave the matter at an inconclusive stage.

Another point which applies to the estimation method used in both the preceding chapter and the present chapter is our inability to carry out a statistical test for the degrees of shifting and the lag coefficients arrived at. Although giving different values to a particular constant and settling on that value which yields the highest R^2 is an accepted practice in empirical analyses,¹⁰ one would be on firmer ground with a statistical test, even if it allowed only an interval to be decided upon. That is, with a statistical test involved, we may be able to say that shifting probably (at a chosen level of significance) was between 10 and 20 per cent or that the lag coefficient lies between 0.1 and 0.3, but a particular value may not be decided upon. Still, it would have been better to use a statistical test. Unfortunately, none of the usual tests fits into the requirements and of necessity, this idea had to be given up.

Finally, we may collect our results obtained so far and compare them with earlier results, wherever they are available. Table 6.5 gives the required figures. The earlier studies used for comparison are those of Laumas and Rao. Gandhi's work, as well as that of Mathew, are ignored here because they did not measure shifting at all, beyond saying whether it was 'significant' (statistically) or not.

¹⁰ See Potluri M. Rao and Roger Leroy Miller, Applied Econometrics, Prentice-Hall India, New Delhi, 1972, pp. 19-20.

Table 6.5 : Various Estimates of Industrywise Shifting for the Seven Selected Industries

(in Percentages)

Industry	Laumas ^a	Rao (Equity base, using L_{t-1})	Present Estimation (without lags)	Same (First Differences)	Present Estimation (with lags)
(1)	(2)	(3)	(4)	(5)	(6)
1. Tea Plantations	177 (205)	65	70	70	65
2. Sugar	149 (185)	-21	110	75	143
3. Cotton Textiles ^b	238 (258)	-39	10	35	-
4. Iron and Steel	158 (170)	104	85	25	95
5. Aluminium	N.C.	-5	10	10	10
6. Paper	169 (164)	-10	50	40	50
7. Cement	121 (148)	-2	5	-35	25

a - The estimates given without parentheses are Laumas' preferred estimates using instrumental variable technique. The ones within parentheses are those using OLS. Laumas did not analyse aluminium industry.

b - The last column is blank because our shifting measure with lags breaks down with $\lambda = 1$.

Laumas computed all the shifting measures given in Table 6.5 to be substantially above 100 per cent and in one case above 200 per cent. These results, for reasons noted earlier, are believed to be unacceptable.

Rao's result for the Tea Plantations is almost exactly the same as ours. That for Iron and Steel is also about the

same in the sense that our results as well as his show fairly high degrees of shifting. Of course, even in the case of Iron and Steel, the first-differences equation computed in this study shows a shifting of 25 per cent only in terms of changes.

All the other industries exhibit negative shifting according to Rao. Out of these, the results for aluminium industry may be said to be not very different because our measures show very low positive shifting whereas his results show very low negative shifting. One may allow some margin of error for both estimates and get a common region of zero shifting. Same is the case in Cement industry if we take into account the shifting estimate without taking lags into consideration. Because of the extreme values of the first observations, however, the estimate with lags (which does not take into account the first observations) is preferred by us. In that case the difference is substantial, though they may still have a common region of low shifting allowing for some margin of error.

Paper and Cotton Textiles industries show quite different degrees of shifting. The biggest difference, however, is in case of the sugar industry where Rao concludes that there is negative shifting to the tune of 21 per cent. Our results indicate that immediate shifting itself is 100 per cent; lags in shifting cause an extra 43 per cent of the tax rate to be shifted.

Thus, our results do not confirm earlier results in all cases though they agree in some cases. In a few cases, our

results are exactly the opposite of other estimates. Our results are claimed to be better on three counts. First, the explanatory power of the equations are generally greater, reducing the possibility that the tax coefficient will contain effects of some excluded variable. This could be achieved, in some cases, through introduction of non-financial variables. Second, the technique adopted is claimed to be superior as it uses the relevant tax rate variable without violating the assumptions of OLS and without resorting to an improper instrumental variable approach. Third, possible lags in shifting are taken into account, which has not been attempted so far.

The analysis, of course, is not without limitations. We have mentioned them earlier, but to repeat briefly, there are two major limitations. Firstly, we have not been able to test our shifting measures statistically (or give a confidence interval), which would have strengthened our results. Secondly, only one distributed lags scheme has been used, recognizing the possibility that a more flexible scheme would probably give better results.

CHAPTER 7

INTERPRETATION OF THE RESULTS AND POLICY IMPLICATIONS

The previous chapter yielded numerical estimates of shifting in the selected industries, with the help of which we can now proceed to find out if there is any systematic relationship between shifting and the different variables embodying different aspects of the market structure. This naturally requires a closer look at the selected industries, which is undertaken below.

7.1 Shifting Groups

As observed in the earlier chapter, no confidence interval for the calculated degrees of shifting could be found out because of the method by which they were estimated. Therefore, it would be safer to take the estimated degrees of shifting as indicators to a broader class of shifting. This we do by dividing shifting into five groups. The number and extent of groups are somewhat arbitrary; but they are designed so that no two degrees of shifting which are substantially different are in the same group, given our calculated degrees of shifting.

The degrees of shifting considered here are those without lags in cases where lag was found to be zero later, and those with lags where there were some positive values of

the lag coefficient (λ). Two exceptions are cement and cotton textiles. Despite lag coefficient being zero the shifting estimate with lags is preferred in the case of cement as it avoids the first observations on the different variables, which are, as mentioned in the previous chapter, extreme values. Cotton textiles industry shows a lag coefficient of unity besides a negative initial shifting. The lag coefficient taking a value of unity is unacceptable as discussed in the last chapter, and so we prefer the shifting estimate without lags even though it may not be exactly correct. The lag coefficient, in any case, is not very important in this case because the degree of shifting in the estimation with lags is actually negative but low. The estimates of the degrees of shifting preferred, then, are as given below:

<u>Industry</u>	<u>Shifting</u>
Sugar	143 per cent (Very High)
Iron and Steel	85 per cent (Very High)
Tea Plantations	70 per cent (High)
Paper	50 per cent (Medium)
Cement	25 per cent (Low)
Aluminium	10 per cent (Very Low)
Cotton Textiles	10 per cent (Very Low)

The classification of shifting as given in the parentheses are done by dividing shifting into five groups as noted earlier: (i) very low (0 to 20 per cent); (ii) low (20 to 40 per cent); (iii) medium (40 to 60 per cent); (iv) high (60 to 80 per cent); and very high (80 per cent and above). The last includes full shifting as well as more than full shifting

under one group. The table above gives the shifting group-wise position in descending order.

7.2 Profiles of the Selected Industries

Now a look at the salient features of each industry is necessary to determine its market structure broadly. Then, an attempt to find a pattern relating the degree of shifting and the market structure of the industry, if it is there, will be made.

In what follows, a few characteristics, considered most important for the present purpose, are examined for each industry. These are: (a) the degree of concentration, (b) the relative size of corporate sector within the industry, (c) extent of government control, (d) status with respect to income tax authorities, (e) relative supply position, and (f) the size of public sector. The degree of shifting is hypothesized to be an outcome of the net effect of all these factors. Amongst these, government control needs special mention, because price control by the government may nullify the effect of all other factors facilitating shifting, by simply denying the companies opportunity to raise prices. That is why wherever it is present (it is actually present in some form or the other in six out of the seven industries analysed), it is discussed in some detail to ascertain its effectiveness. The approach is not rigorous; but it is meant to indicate methods through which the estimated degrees of shifting might have come about.

An effective government control, not responding to

corporate income tax in any way, would definitionally rule out forward shifting. Thus, a priori, in a controlled industry, 'low shifting' result would be expected. Any other result would have to be justified by either showing that control was not completely effective, or that the controlling authorities did respond to tax rate changes. This is what has been attempted in the following subsections. The emphasis is on forward shifting, though possibilities of backward shifting are also considered.

7.2.1 Sugar¹

The organized sugar industry is comparatively recent in India. Its rapid progress started in the early thirties after the grant of protection in 1932. This led to such a spurt in production that after the initial burst the growth of the industry became slow and halting. To remedy the situation the Tariff Board recommended abolition of protection with effect from 1950. Regulated and planned development of the industry was initiated in May 1952 under the Industries (Development and Regulation) Act, 1951, and the government adopted a policy of licensing. Since then, despite tremendous fluctuations in sugar production, the total capacity has been increasing more or less steadily. The country became an

1 The facts presented are gleaned from chiefly two sources: Report of the Sugar Enquiry Commission, Ministry of Food and Agriculture, Government of India, New Delhi, October 1965, and Report of the Sugar Industry Enquiry Commission, Ministry of Agriculture, Government of India, New Delhi, 1974.

exporter of sugar after some time. Initially, sugar production was chiefly from two States, Uttar Pradesh and Bihar. Slowly other States also came into the picture, the most important one being Maharashtra. The progress of the industry in Maharashtra has been so spectacular that it now stands as the largest sugar-producing State. A major characteristic of this expansion was that the new units were mostly cooperatives,² generally with comparatively larger capacities. This was both because of economies of scale and active government support to cooperatives through its licensing policy.

There is an important implication of this fact, relevant for the present purpose. Upto 1968, the income of cooperatives was wholly tax-exempt (section 81, Income Tax Act). After 1968, sugar cooperatives (using power) ceased to get this benefit; but they continue to enjoy the benefit of a comparatively lower rate of effective tax due to various concessions (section 80P, Income Tax Act). Sugar industry is, however, not accorded priority industry status by the Income Tax Act.³

The industry is fairly competitive with a large number of firms and their distribution among various size-groups (capacity-wise) is symmetrical, i.e., a large number of them

2 See Appendix Table C.2.

3 Priority industries get a higher rate of development rebate, which makes the effective tax rate lower than non-priority industries. For a list of such industries see Ninth Schedule, Income Tax Act. They also used to enjoy a statutory deduction from their income upto 1st April 1973 (Section 80I).

belong to a mean size-group, the number of factories in each size-group falling as bigger or smaller size-groups are progressively considered.

One of the features of this industry has been the dissatisfaction among consumers and cane-growers with the industry. The cane-growers have always complained of being underpaid and consumers have always complained of being overcharged. The various Commissions that went into the working of the industry have guardedly concurred with these charges. The government, as a result, has had to control the sugar industry to a great extent. However, during the period under analysis, control was not always present, and even when it was present, it was in various degrees. Minimum sugarcane prices, which constitute the major portion of the costs, have been fixed by the government since 1951. This has continued upto the end of the period under consideration, with periodical revisions. Sugar prices themselves have been controlled intermittently. From 1954-55 to 1956-57 sugar prices were decontrolled. Control was reimposed in the year 1957-58. In July 1959, government took over the entire production for direct allocation. All controls except regulation of monthly releases of sugar from factories were removed with effect from 28th September, 1961. With effect from 17th April, 1963, price and distribution controls were reimposed as the sugar industry responded with soaring prices to the 1961 decontrol. In August 1967, the government announced partial decontrol

(takeover of 60 per cent of production at fixed prices, leaving the rest for free sale) to be effective in the year 1967-68 as sugar production was very low and the industry had to be encouraged. For the year 1968-69, the 'levy' allocation was raised to 70 per cent from 60 per cent. In 1970-71, the quota was again reduced to 60 per cent. Sugar was totally decontrolled on 25th May, 1971, though regulation of releases continued. With effect from 1st July, 1972, partial control was again imposed, the levy quota being 60 per cent (plus 3.5 per cent for export). In 1972-73, the levy quota was raised to 70 per cent (inclusive of export quota). This continued upto 1974-75.⁴

Although sugar production shows an upward trend despite the fluctuations, it has generally not been sufficient to cover domestic and export demand. Consumer taste has been shifting in favour of sugar from gur and this has contributed to the demand. Naturally, the latent potential for raising price has always been there and sugar factories have always utilized it during decontrols and partial controls. An indication of this can be had from the behaviour of the wholesale prices vis-a-vis the extent of control present. It will suffice here to state that during our reference period, there

⁴ For details, see Tariff Commission, Report on Cost Structure of the Sugar Industry and the Fair Price for Sugar, Chapter 7, Government of India, Bombay, 1969; and Tariff Commission, Report on the Cost Structure of and Fair Price Payable to the Sugar Industry, Chapter 6, Government of India, Bombay, 1973.

were four occasions when prices jumped up, out of which three occasions coincided with total or partial decontrols. The relevant years are 1962-63, 1967-68, 1971-72 and 1972-73, the percentage rise from the previous year being 40.41 per cent, 12.68 per cent, 21.7 per cent and 25.47 per cent respectively. Even in the last case, where the price rise and reimposition of partial control coincide, the said control was imposed only in July and with 63.5 per cent of the production being sold at controlled prices. On the other hand, there is only one case of noticeable fall in prices in the year 1963-64 (immediately following the largest price rise of 40.41 per cent in 1962-63), when control was reimposed after a gap of two years. This bears out our contention that sugar producers took advantage of the decontrol years to raise prices.

In view of the above history of sugar control, it is not surprising that sugar manufacturing companies have more than fully shifted their burden. Political influence of the sugar manufacturers' lobby in two major sugar producing States (Maharashtra and Uttar Pradesh) might have facilitated it.

The observed lag in shifting is probably due to the alternating controls and decontrols. This is because of the fact that after a rise in the tax rates, the manufacturers had to wait for a chance to raise profits, which would come with the subsequent decontrols. Besides the forward shifting, backward shifting on to cane suppliers also cannot be ruled out, despite the minimum prices prescribed for sugarcane.

Underweighing, delaying payment, claiming the cane to be of a lower quality than it actually is (because price to be paid is linked with quality statutorily), are various charges made against the sugar manufacturers.⁵ This is particularly facilitated by the fact that except in years of very low crop of sugarcane, each sugar factory purchases cane from more than 10,000 sellers, turning the cane market into a local monopsony. Thus, the high degree of shifting in this industry probably consists of both forward and backward shifting.

7.2.2 Iron and Steel

For quite some time after its inception in India with the establishment of Tata Iron and Steel Co. (TISCO) in the early part of the present century, this industry was a clear-cut monopoly. Gradually, other firms like Indian Iron and Steel Co. (IISCO), Steel Corporation of Bengal (SCOB, which later merged with IISCO), Mysore Iron and Steel Works (MISW, later renamed Mysore Iron and Steel Limited, and again renamed Visvesaraya Iron and Steel Limited) started production. But TISCO continued to lead the field by virtue of its sheer size and experience.

In the Industrial Policy Resolution in 1956, iron and steel was declared as a key industry. The later resolution on industrial policy did not alter the position a great deal.

⁵ See the Report of the Sugar Industry Enquiry Commission, 1974, op.cit., especially the chapter on pricing of sugarcane.

Existing private firms were allowed to continue, but new entry into this industry was the exclusive right of the public sector. And the public sector did come into this industry in a big way with Hindustan Steel Ltd. (HSL).⁶ Very soon it became the leader with its multi-unit operation in different parts of India. However, this did not affect TISCO adversely, and it continued to grow at the same rate as earlier.

HSL, TISCO and IISCO accounted for the major portion of the production of both steel ingots and saleable steel. Thus, concentration has always been pretty high.⁷

Because of the heavy investment necessary, the industry is completely corporate. Thus, the corporate income tax affects all in the industry. It is practically impossible to change the form of the business and avoid the tax.

This industry has been accorded the status of a priority industry from the beginning and therefore had a lower effective tax burden compared to a non-priority industry.

The relative demand and supply position is that the latter has almost always fallen short of the former. The government has tried to control demand and artificially keep it near the supply position by using the quota system and various permits needed to buy steel in bulk. But the flourishing corruption and black market with regard to steel and/or these permits shows the actual demand position clearly. India

6 Until then, MISL was the only public sector unit.

7 See Appendix Table C.4.

both imports and exports iron and steel, but net import has always been positive.

We now come to a very important feature of the industry - government controls.⁸ This is important for our purpose, because at least theoretically it should affect tax-shifting.

However, before we come to a brief discussion of controls, an important fact has to be noted. The product 'iron and steel' actually consists of various products of distinct types, which are used for different purposes, e.g., structurals, rails, bars and rods, plates, sheets, skelps, strips, billets, etc. This is relevant because sometimes only a few of these have been controlled due to specific policies of the government.

The control of iron and steel dates back to 1941 (just after the outbreak of Second World War) with the promulgation of the Iron and Steel (Control and Distribution) Order under the Defence of India Rules, 1939. It was extended by further legislations until 1955 when Essential Commodities Act was enacted, which amended the constitution and became a permanent provision to be used whenever felt necessary.

⁸ The following references give details: (i) Report of the Study Team on the Iron and Steel Controller's Organisation (Part I), Ministry of Iron and Steel, Government of India, New Delhi, May 1966; (ii) Report on Steel Control, Ministry of Steel and Heavy Industries, Government of India, New Delhi, October 1963; (iii) William A. Johnson, The Steel Industry of India, Oxford University Press, Bombay, 1967; and (iv) White Paper on Steel Industry, Ministry of Steel and Mines, Government of India, New Delhi, 1976. Besides, reports of Tariff Commissions and the Department of Steel provide useful information.

"Many of the functions of India's steel mills are regulated, or have actually been assumed, by the government. All new investment must be licensed by New Delhi. Minimum wages are set by a Wage Board appointed by the Central Government, and dismissals are circumscribed by the laws of the States. Until recently most steel prices were established by the ministry responsible for the industry. The rolling schedules of each of the integrated mills and the distribution of most types of steel were also determined by an agency of this ministry. Since 1964 there has been some liberalization of these controls. Even so, there continues to be substantial government regulation of the industry."⁹ All statutory controls were removed in 1967; but for all practical purposes, it continued until the end of the period under review, through some powers the government retained. This is explained later.

Prior to 1964, the government used to control the price and distribution of iron and steel directly, through the Office of the Iron and Steel Controller. Sometimes particular types of steel were decontrolled. Also, small quota holders (less than one wagon) could avoid routing their order through the Controller's office and buy from the stockyards. The Controller also used to give priority ratings to various work orders sent to steel producers.¹⁰ But this was hardly

9 William A. Johnson, op.cit.

10 Consumer orders ratified by the Controller, when sent to the producer, is called work order.

enforced and manufacturers took full advantage of the lack of enforcement by picking up only those work orders which suited their convenience.

In response to the Raj Committee's recommendation (the 1963 report on Steel Control, referred to in footnote 8), the government restructured the price and distribution control. A Joint Plant Committee (JPC) consisting of representatives from all steel plants, the railways, and the Iron and Steel Controller was formed along with a Steel Priority Committee (SPC). Most of the controlling work was delegated to JPC though the government retained its power to declare prices of a few scarce categories of steel. The Iron and Steel Controller became an agency to enforce and oversee the directives given by JPC and priorities given by SPC. In 1967, all statutory control by the government was withdrawn and it devolved on JPC to control the industry and guide it in the right direction. However, JPC had to take all decisions in consultation with the government, which means that the government had a sort of veto power over its decision. As earlier, defence, government departments, railways and basic industries continued getting top priority along with export-oriented producers. The government took over IISCO (initially for a period of two years) on 14th July, 1972. On 24th January, 1973, Steel Authority of India (SAIL) was formed which brought all the public sector bodies connected with iron and steel under one management - thus effecting a complete vertical integration.

Besides, it was entrusted with the job of overseeing the working of the industry in conjunction with JPC.

On the price front, prior to 1964, there were two different types of prices, one for the producers (called the retention price) and the other for the consumers (called the selling price). The difference between the two constituted of two items: surcharge and railway freight charges. After February 1964, these two prices were equalized. In 1973, the distinction was again brought in by the JPC. However, in examining shifting, only the retention prices (which is the same as selling prices in the period 1964-73) are relevant. Basically, the method of calculating the retention price was to calculate per unit cost of production and add the rate of return per unit of production to it. The latter was found out by estimating capital employed and allowing a fixed rate of return on it, which yielded the total return to be allowed. On the basis of an assumed rate of capacity utilisation (capacity being known), total output was estimated. Total return divided by total estimated output yielded the rate of return per unit of production. The point to be noted here is that the rate of return allowed (8 per cent upto 1964) was the before-tax rate of return, which means that it would not change with the changes in tax rate.

These retention prices were initially calculated for each integrated steel unit separately. But in 1955, uniform retention prices were fixed. There was an escalator clause

which provided for revision of these prices upon claims of increased cost from the manufacturers. Such revisions did take place in February 1957, May 1958, November 1959, November 1960, September 1962, and twice in 1963. After that, retention prices were the same as selling prices. Prices were revised practically once every year, besides price revision for specific categories, called price 'extra's.

From this brief account, a few facts emerge. One, that due to wage control, backward shifting on to labour is a dim possibility. Besides, both TISCO and IISCO, the two steel mills in the RBI sample, have two of the strongest labour unions, which would make downward revision impossible and even stopping or postponing the increases in wage that would be necessary to shift tax increases very difficult indeed. Backward shifting on to raw materials is out of question, because the major part of the raw materials comes from captive mines. The other major input, power, comes mostly from coal. The coal requirement is partly covered by their own captive collieries, and the rest from the nationalized collieries. Again, shifting is rendered practically impossible. Pricing also has been controlled, but it is possible that the price control was not very effective.

Both IISCO and TISCO adopted the technique of claiming price increase immediately after an increase in price actually took place, on the basis of their assertion that the costs had already increased enough to absorb any benefit that would have accrued to them because of the actual increase in price.

Also, the fact that prices have been regularly revised upward cannot be denied. After the formation of JPC in 1964, both TISCO and IISCO were at least theoretically in a position to influence the pricing to some extent due to the presence of their men in JPC. Moreover, occasionally, a few particular products of this industry have been kept outside the purview of price control. This would give them an opportunity to recoup some of the profits lost due to higher taxation. Thus, it appears quite possible that despite the all-round and continuous control on the industry, the two private firms were able to shift the tax by influencing the price-control mechanism itself, and making use of whatever small loopholes there were in the price-control.

The presence of public sector might have affected their profits adversely, but it need not necessary go against shifting. Given the fact that even public sector companies are taxed at the same rate as private sector companies, and the fact that they have been mostly making losses although they are expected to make some profit, it is a certainty that the management of these companies would like to shift the tax as far as possible in order that losses are not further increased.¹¹ In that case, they would have joined hands with the private sector in asking the government for price increases.

¹¹ They are certain to be motivated by their concern for their own position and career, since they are the ones who will be held responsible for bad financial performance of the companies.

And in JPC, this would have left only two representatives who were not swayed by this consideration—the representatives from the railways and from the office of Iron and Steel Controller. Thus, in all probability, the attempts of the private sector at shifting the tax were supplemented by the public sector.

7.2.3 Tea Plantations

Tea has been a traditional industry in India, very important for the economy because of its foreign-exchange earning capability.

This industry is almost wholly in private hands, corporate sector being quite sizable. Being a plantation crop, the distribution of estates is important to assess the market structure. It is highly skewed with respect to size and number. The larger estates, which account for the major part of the area under tea, are much smaller in number whereas the smaller estates are much greater in number. However, the major part of total production comes from the bigger estates.¹² The concentration, in the usual sense of production being concentrated in a few firms (say, less than five) is not there; the number of large estates is also quite large. But a tacit collusion amongst the larger estates, generally owned by companies, cannot be ruled out, because of the powerful associations in the north-east India, where most of the large estates are concentrated.

12 See Appendix Table C.1.

The government has generally adopted a policy of encouragement to this industry through direct methods like technical help, providing loans, easing import restrictions on processing machinery, and through fiscal incentives. It is included among the priority industries under the Income Tax Act and therefore eligible for a higher development rebate since 1966. Moreover, a special development allowance (section 33A, Income Tax Act) has been given to this industry.

The production of tea has increased over time, but the increase is largely due to higher productivity rather than increase in the area under tea plantation. The share of domestic consumption in the increasing total production has been increasing, keeping the supply position comfortable. Broadly speaking, supply has been matching demand in the domestic market. But in the world market, India's share has been declining over the years. Even fifteen years ago, India and Ceylon were practically the only countries to supply tea to the world market. But other countries have been making inroads since then (particularly the East African countries), in the face of which India has given way. Because of the fierce competition amongst the tea-producing countries and producers of its close substitute, coffee, the situation in the world market has been going against India. The major market in the international level is U.K., which enjoys a monopsonistic position. As a result of these circumstances, tea prices abroad have actually been declining. Domestic

prices of tea, however, show a steady upward trend, but the rise in prices have been much less than, say, all commodities.

There is no government control on either the distribution or prices of tea. Tea Board, a semi-government body, holds the tea auctions, but that is only convenience rather than compulsion for the tea estates. They are free to sell tea to anyone at any price they please if they so desire, and sometimes they do sell tea on their own. Tea Board also acts as a sort of buffer between the estates and the government, and besides acting as an advisory body for both sides, channels most of the governmental help to the industry through itself.

It seems from the foregoing discussion that though this industry is facing difficulties abroad, it is able to more than compensate for it in the domestic market. The lack of any control on prices allows them to shift the tax, provided they act in unison. The decision to shift the tax by the majority of the producers may actually be taken, in view of the fact that ninety per cent of total tea produced is by the larger plantations, which are much smaller in number than the smaller ones. The general belief, however, is that they have kept their prices very low. The Barooah Committee, for example, remarked that "Unlike other industries, tea is not able to pass on the burden of taxation to the buyer".¹³ The industry's

¹³ Report of the P.C. Barooah Committee on the Tea Industry, Directorate of Commercial Publicity, Ministry of Commerce, Government of India, New Delhi, 1969, p. 88.

spokesman (chairman of Indian Tea Association) claimed in the ninety-fourth annual general meeting in 1974, "... the industry was squeezed between rising costs and taxes on the one hand and stagnant prices on the other. And yet, by steadily raising yields and practising austerity, we continued to supply to the overseas buyers all the tea they wanted and yet had plenty to spare for the needs of our countrymen".¹⁴ This obviously implies that they did not shift the tax. In view of our results, this is an incorrect statement, unless it refers to only the indirect taxes, about the shifting of which we do not know.

Backward shifting on to labour (in fact, there is no other avenue of backward shifting open for this industry, since the only important input is labour) is not very probable because there are governmental regulations covering every aspect of payment to labour, monetary or otherwise. The Plantation Labour Act covers the non-wage benefits to be given and the Minimum Wages Acts of various States cover the money wage.

Thus, the shifting that took place must have taken place through price rise in domestic market only, the absence of price control and the concentration of production among the large plantation owners only contributing to it.

¹⁴ CTTA Tea Digest, Calcutta Tea Traders Association, 1975, p. 111.

7.2.4 Paper

This is an industry which cannot be called really traditional in the sense that it is only about a century old. But amongst the manufacturing industries, it is probably the oldest. But it did not expand much until the First World War. The two wars gave it a fillip and after independence it has expanded considerably.

This industry is highly capital-intensive and there are considerable economies of scale. In spite of this, there are very few units in India with a really large capacity (by international standards) due to capital shortage. Only three companies, Orient Paper and Industries Ltd. (2 units), Titagarh Paper Mills Ltd. (3 units) and Ballarpur Industries Ltd. (including the erstwhile Shree Gopal Paper Mills which merged with it in 1969) have capacity above 45 thousand tonnes per year. These three account for about 40 per cent of the total production. Thus, though the number of firms in this industry is not very small, there is some concentration in the industry.¹⁵

The industry is almost wholly corporate because of the heavy capital investments required. It has been left to the private sector by the industrial policy of 1956, the government having the option to join in.

However, the government is yet to exercise its right to start production in this industry in a big way though it

¹⁵ See Appendix Table C.6. Also See Paper Industry: Problems and Prospects, National Council of Applied Economic Research, New Delhi, 1972.

has done so in the case of newsprint. The domestic private sector is protected against foreign competition, except in the case of a few special varieties which are either not produced in India, or, whose supply is inadequate. The Income Tax Act allowed priority industry status for this industry since 1966, resulting in a lower effective tax rate.

The demand for paper has always been higher than its supply. Particularly during the 'seventies, paper shortage became more and more acute, with no sign of the situation improving in the near future. The higher literacy rate in an increasing population has been greatly contributing to the higher demand for paper. The market for paper is somewhat monopsonistic, because the government (various departments and agencies) purchases about 25 per cent of the total production at a lower rate than the one prevalent in the market for the ordinary consumer. Supply is constrained by the availability of the major raw material, bamboo. With the machinery and equipment that is presently in use in this industry, a changeover to some other raw material in a big way would require a very large investment to replace or modify the plant and equipment. Moreover, a viable alternative raw material, available in the required quantity, has not emerged yet. A likely alternative is bagasse; but since it is used as fuel in the sugar factories themselves, an alternative fuel for those factories has to be provided first to divert bagasse for paper production.

The price of paper has been controlled since the beginning of the period under discussion. However, statutory controls were removed in 1968. During this period, prices have risen steadily, on the recommendation of the Tariff Commissions as well as due to ad hoc increases in price allowed by the government on the basis of representations made by the industry. The usual plea has been rising costs, particularly that of bamboo (inclusive of transport) and chemicals used. The rate of return allowed was 12 per cent on capital employed and this rate was gross rate of return, inclusive of interest and tax provisions, what we have earlier called Y^E (total base). After 1968, despite the absence of statutory control, some control through informal regulations and negotiations continued. There are two associations of producers (The Paper Manufacturers' Association and The Paper-Makers' Association) which eliminate competition between the producers and act as the industry's representatives during negotiations with the government prior to proposed raises in price.

Thus, except for price controls, everything can be said to be conducive to shifting. The medium concentration, the potential for a price-boom due to relative shortage in supply, the existence of producers' associations - all these factors would normally facilitate shifting. Against these factors, price control—formal and informal—was the only factor which could have prevented shifting. The result of

medium shifting that we have arrived at is probably the result of the price control factor nullifying the other effects to some extent. It is undeniable that the prices have risen pretty fast; but it is also true that costs rose very fast. Moreover, as mentioned above, the government buys a sizable part of the total production at prices fixed by itself. That being so, it is only rational on the part of the government to keep that price as low as possible to minimize its own expenditures. This would restrict the scope of shifting to some extent. Hence, the net result may well be medium shifting, which it is.

7.2.5 Cement

The cement industry in India is, by no means, a traditional industry. Though the first unit was established in 1913, it picked up only after the Second World War. Initially, people were cautious in accepting it, but by the middle of the present century, cement became very important as an infra-structural commodity.¹⁶

The number of units is not very high. There is some concentration in the industry. The undoubted price leader is Associated Cement Companies (A.C.C.) with more than 35 per cent share in total production. The other big companies are

¹⁶ See The Cement Industry in India, 1914-1964, Cement Manufacturers' Association, Bombay, 1964, for details. Various Tariff Commission reports also provide a great deal of information.

India Cements Ltd., and Birla Jute Manufacturing Co. Ltd.¹⁷ The Sahu-Jain group with four companies (Jaipur Udyog Ltd., Rohtas Industries, Ashoka Cements and Sone Valley Portland Cements) also has considerable market power. The concentration is on the decline, though even upto 1975, the top three and top five companies accounted for 51 per cent and 59 per cent respectively of the total production.¹⁸

This industry being a heavily capital-intensive one, with high economies of scale as reported by various Tariff Commission reports, requires heavy initial investment. As a result, it is entirely in the corporate sector.

The government did not, in the beginning, want to get into this industry as a manufacturer. But, it was becoming increasingly evident that the private sector would never be able to satisfy even a reasonable part of the demand for cement by itself since the growth of capacity was far slower than that of demand. Therefore, the government finally entered the field and slowly started enlarging the number of units. However, in 1975 the public sector had only 10.6 per cent share in the total production with ten working units. The tax authorities from the beginning of our reference period, had decided to give encouragement to this industry by lowering the effective rate of taxation through priority industry treatment.

¹⁷ This company started in the field of jute manufacturing, but later diversified into cement also.

¹⁸ Appendix Table C.7 gives production data of some big units.

As noted above, there has always been a heavy shortage of supply relative to demand, giving rise to a thriving black market. This shortage has been heightened by the rising costs in this industry, despite easy availability of principal raw materials. There were many factors responsible, use of old and obsolete plant and machinery being the major one. Wagon shortages (the industry depends a great deal on the railways for the transport of raw materials as well as the product) and power breakdown have been other causes.

There has been continuous government control on the pricing and distribution in this industry since 1942, when about 90 per cent of the production was consumed by the government. This percentage came down sharply after the war, but even in 1975 the various government agencies together were consuming around 25 per cent of the total production. And their purchase price is even lower than the controlled price. For two years, 1967 and 1968, the distribution was handed over to the industry itself which promised to exercise voluntary control through CACO (Cement Allocation and Coordinating Organisation). But it did not work satisfactorily and from the beginning of 1969, the government again took over the distribution. The periodical enquiries by Tariff Commissions have been fixing the ex-works prices of cement subject to the approval of the government. A peculiar feature is the higher prices allowed to high cost firms, though for the consumer there is a uniform selling price, irrespective

of the producer. The rate of return allowed has not been the same over the years, and it is supposed to cover provisions other than tax provision, besides interest provisions. For example, it includes bonus to employees also. Therefore, it is difficult to find out the extent of change in before-tax (or after-tax) rate of return allowed. In any case, the allowed rate of return changed only twice during the period under discussion. There were, of course, many ad hoc revisions in price in response to representations from the industry complaining of higher costs.

It is clear that once again all the features of the industry are conducive to shifting except the control on price and distribution. Moreover, this industry also has a powerful association of producers called Cement Manufacturers' Association. But this was probably counteracted by the government being the single largest customer, and at rates below those fixed for ordinary consumers. The capacity and production did expand in this industry, but mostly through new units, which were predominantly in the public sector. This implies insufficient ploughback of profits, signifying low retention of profits after meeting tax provisions and dividend requirements which can be called an indirect evidence against shifting. The low shifting result, therefore, means that control was more successful in this industry compared to, say, iron and steel. On that score, our result for this industry is not at all surprising.

7.2.6 Aluminium

This industry is one of the industries which have developed well after independence. The product, however, gained quick popularity due to some technical advantages it enjoyed over traditional metals and alloys in various uses. For example, aluminium has substituted iron in a big way in constructions and many other uses and has replaced copper in electrical uses.

The industry was a pure duopoly for quite some time (upto the early sixties) with Indian Aluminium Company (INDAL) and Aluminium Corporation of India (ALUCORP) being the two producers. They were joined by Hindustan Aluminium Corporation (HINDALCO) which pushed ALUCORP to the third place. Other aluminium companies to join later were Madras Aluminium Company (MALCO) and Bharat Aluminium Company (BALCO). The latter has started production only recently. It is a public sector concern with the largest capacity. The rest are also expanding fast. There are some more companies in this industry, but their size is not significant and many of them do not actually produce ingots (primary metal) at all. Thus, though the degree of concentration is a little less than earlier years, it is still very high.¹⁹

This is another industry where a huge initial investment is necessary and where, due to the possibility of having

¹⁹ See Appendix Table C.5. For other information, see reports of the Tariff Commissions.

assured supply of raw materials through captive mines, economies of scale are available. Naturally, the industry is wholly corporate.

The industry is a protected one, though the government had to import some aluminium always to satisfy the demand from consumers. However, the government conducts periodical enquiries to determine the desirability of continuing protection. Hence, the 'Damocles' Sword' of the threat of foreign competition has been hanging over the industry. The entry of public sector, being after 1975, is not relevant for our purpose here. The industry also enjoys the priority industry status as per the Income Tax Act.

Broadly speaking, the demand for aluminium is higher than its supply, as is evident from the positive net imports. However, unique uses of aluminium are few and far between. It is used largely as substitutes to other metals and alloys in various uses, primarily because it is a cheaper substitute and comparatively easily available. In this set up, its performance as a substitute to the accepted metals and alloys had to be proved first. Secondly, it had to be sufficiently cheaper than the ones it was substituting. Naturally, its demand for the initial years (its comparatively recent emergence must be kept in mind) could not have been very high. And it is almost certain that its demand is highly price-elastic with reference to its own as well as the price of the substitutes. The high demand cannot be taken for granted. The raw materials, mainly

bauxite, is plentifully available in India, and given the infrastructural inputs like power, the industry has a very big potential.

The industry has been under a government leash from the very beginning, though it was unlike all the industrial controls we have discussed so far. The threat of foreign competition and from producers of the products it has been substituting has been very real, particularly the former. The price of imported aluminium is far cheaper than the indigenous type. To encourage and promote this industry, the government had to follow a protection-subsidy policy, because the market prices did not cover the costs. But slowly the industry came of age. In 1967, informal price control through negotiations was introduced, and the protection continued. In 1971, the government declared that protection will be withdrawn with effect from 1977 and introduced statutory price control.

This brief outline of the industry shows two things. First, as long as it was dependent on the subsidy-protection policy of the government, it was virtually impossible for it to shift the tax. Because, although it was free to raise prices, such a step would have been suicidal for the producers as the market price did not even cover their costs (including normal profits). Even later, when the industry managed to cover costs, any price rise to shift the tax entailed the risk of withdrawal of protection as well as the market reacting sharply to it. Backward shifting was not possible because

the major raw material—bauxite—came from captive mines and the prices of other inputs including labour were beyond their control. Therefore, very low shifting result is not unexpected in this industry.

7.2.7 Cotton Textiles

This, like tea plantations, is another industry which is quite old. The handloom sector goes back many centuries and even the mill sector is about two hundred years old.

Although firms which would come under cotton textiles are found all over India, there is a concentration of them in Maharashtra and Gujarat. There is a large number of firms in this industry and concentration is practically absent.

The industry has quite a few large firms in the corporate sector, but by no means is the corporate form predominant.²⁰ Practically all forms of business are found to a significant extent in this industry. Handlooms - organized in the form of cooperatives or not organized at all - are constant competitors of mill-made cloth. The handloom sector, quite big in size, has the advantage of government backing in various forms, because of the policy to promote small-scale industries.

The mill sector, naturally, does not get much of encouragement from the government. However, it happens to be the biggest manufacturing industry in India, in terms of

20 See Appendix Table C.3.

capital invested as well as labour employed. So the government cannot completely be apathetic to the happenings in this industry. The point is, it does not do anything with a view to helping the mill sector as such, except to help promote exports. In fact, the government's policy has been to shift weaving as far as possible to the handloom sector, leaving only spinning for the mill-sector.

The demand for cotton textiles is also on the wane due to the advent of synthetic fabrics. This has affected the industry very adversely in both domestic and foreign markets. The raw materials price (i.e. of raw cotton) has been soaring, but due to heavy competition, cotton cloth prices did not go up very much, resulting in profit erosion. There are alternative technologies available for cotton cloth production, and the existence of economies of scale are yet to be proved.²¹ Thus, a large cotton textile company may not have any intrinsic advantage over a much smaller one-man establishment, particularly in view of the government patronage to smaller establishments. As a result, the capital requirement is not necessarily high.

There is no statutory control on this industry. However, as we noted earlier, the government policy has been to

21 Actually, most empirical studies find the production function (for the mill sector) to be of the Cobb-Douglas type, with constant returns to scale. This clearly shows that there are no economies of scale to be obtained. See D.U. Sastry, Productivity in the Indian Cotton Mill Industry (Mimeo.), Institute of Economic Growth, Delhi, February 1981.

allow increase in spindlage, without allowing increase in loomage. The increased yarn production is siphoned off to the handloom sector. There is an informal price control at this level, because the government itself buys the yarn at rates practically imposed by itself and sells them to the handloom sector. The intention obviously is to help the small-scale sector to get cheap yarn, so that their product is cheap. This industry is a priority industry for the purpose of development rebate only, and that too from 1970. Other benefits of priority industries, like statutory deductions,²² were not available to the cotton textiles industry.

It is obvious that the industry situation is completely unfavourable for shifting. The mill sector is in particularly difficult position, and the corporate sector being in the mill sector, the result of very low shifting is not surprising at all.

To sum up, we find that the industry situations as revealed by our discussions above, do support our findings broadly. Out of the seven selected industries, only one was practically without any government control. In the six that were controlled, the comprehensiveness of control differed. Iron and steel, and Cement were controlled to the greatest extent. Sugar was controlled fairly comprehensively but in fits and starts. Paper, cotton textiles and aluminium industries

22 Discontinued for all companies since 1973.

were controlled either indirectly or informally. The industry left to itself was tea plantations.

One would be tempted to conclude that in a controlled industry, shifting will not be possible since the firms in those industries have no control over the prices. By the reverse logic, shifting is possible (but not necessarily present) in uncontrolled industries. But the first part of such conclusion would not be entirely correct, as we have shown. However, the fact remains that the burden of proof is on those who claim that shifting is present in a controlled industry. In the above discussion, we have tried to indicate how the estimated degree of shifting (only broadly speaking) could have come about. Only in case of iron and steel industry, we have difficulty in explaining the result arrived at, and therefore had to look beyond formal economics into what may be called the 'political economy' of controls. The explanation, by the very nature of it, is practically impossible to substantiate, but we are led by 'circumstantial evidence' to that explanation. A theoretical basis for such behaviour is provided by the theory of rent-seeking which is based on similar propositions. The rent that the producers get is both legal and illegal like the methods adopted to get it. The illegal or black-money gains cannot explain our result because our results are based on the official accounts of the companies, which obviously will not reflect the illegal gains. However, the theory amply demonstrates that rent-seeking—by

fair or foul means—is perfectly rational when controls are present on the market.²³ Influencing the controlled price may be such a rent-seeking activity, rational as long as the increased profits due to the 'influenced' rise in prices is greater than cost incurred in 'influencing' the price.

7.3 The Possible Presence of a Pattern

Our purpose of going into the profiles of the seven selected industries was, however, to check whether there is a pattern to the degree of shifting vis-a-vis the industry situation as revealed by a few indicators. This, obviously, is a very limited attempt in that direction, with some arbitrariness unavoidably present. But the objective is only a brief exercise in interpreting our findings on the degree of shifting in different industries, not a comprehensive analysis. Table 7.1 is prepared to aid the exercise.

To start with, let us consider concentration and shifting. The two cannot be correlated because aluminium industry, with a high degree of concentration, shifts the tax very little whereas tea plantations, despite a low concentration, are able to shift a large part of their tax burden. Out of two industries with high concentration, one shows very high shifting and the other very low; of the two with medium concentration one shows medium shifting and the other low; and

²³ There is an embryonic literature on rent seeking. For example, see Anne O. Krueger, "The Political Economy of the Rent-seeking Society," American Economic Review, Vol. 64, June 1974, pp. 291-303.

Table 7.1 : Degree of Shifting and Other Characteristic Features of the Seven Selected Industries

Industry	Degree of Concentration	Controls by the Government	Size of Non-Corporate Sector	Size of Public Sector	Traditional or Not	Industry Status under Income Tax Act	Relative Demand Position	Shifting
1	2	3	4	5	6	7	8	9
Sugar	Low	Complete but sporadic	Medium	Negligible	Non-Traditional	Non-priority industry	High demand	Very High
Iron and Steel	High	Significant but not statutory after 1967	Negligible	Large	Non-Traditional	Priority industry	High demand	Very High
Tea Plantations	Low	None	Small	Negligible	Traditional	Priority industry since 1966; development allowance since 1965	Taking overall picture, no excess demand	High
Paper	Medium	Informal	Negligible	Negligible	Non-Traditional	Priority industry since 1966	High demand	Medium
Cement	Medium	Complete	Negligible	Small	Non-Traditional	Priority industry	High demand	Low
Aluminium	High	Only indirect, through protection policy. Direct after 1971	Negligible	Small	Non-Traditional	Priority industry	High demand	Very Low
Cotton Textiles	Low	Partial	Large	Negligible	Traditional	Priority industry for development rebate purpose only from 1970	Low demand	Very Low

Note: The terms used in the above table are only indicative and have no quantitative connotations.

among the three industries with low concentration, one shows very high shifting, one shows high shifting, and the third very low shifting. Obviously, no pattern is visible.

As for the third column, again there is no visible pattern if we juxtapose the extent of government controls and degree of shifting. Tea plantations show high shifting without controls, whereas iron and steel show very high shifting with controls.

Similarly, none of the columns, considered by themselves, show any pattern vis-a-vis shifting. This only leads us to a conclusion that no convenient generalization about a certain feature of the industry and the consequent degree of shifting can be made. Various factors have their own influences on shifting, and the shifting that actually occurs is a result of the sum total of these diverse effects, taking into account their relative weights. Reference should be made here to Kilpatrick's study,²⁴ which assumed positive and high correlation between concentration ratio and shifting. Concentration may facilitate shifting, but it is a risky jump to conclude that concentration and shifting are positively related in fact, because that means one is deliberately ignoring other important factors.

7.4 Policy Implications

Before the policy implications are derived, it must be

²⁴ R.W. Kilpatrick, "The Short Run Forward Shifting of the Corporation Income Tax," Yale Economic Essays, Vol. 5, No. 2, Fall 1965, pp. 355-420.

made clear that it is assumed here that the government considers corporation income tax as a non-shiftable direct tax and all the changes in the corporate income tax laws are made under the same conviction. In that case, given the course of action chosen by the government, no change in its policy is necessary for the cotton textiles, aluminium and cement industries, because in these cases the presumption of the government (that the tax cannot be shifted) happens to be true. However, for the other four industries examined, changes in policy are indicated.

Since our shifting index is the profit rate, it gives a combination of backward and forward shifting. Backward shifting can comprise of that onto the raw materials suppliers and onto labour. As to the backward shifting onto raw materials suppliers, we have seen above that only sugar industry is possibly doing this. In this case, the raw materials suppliers are sugarcane-growers, i.e. a particular group of farmers. To stop this, the obvious measure is to formulate a 'proper' sugarcane pricing policy. The 'proper' policy would be, broadly speaking, to see to it that the price reflects costs of agriculture, general price level and the quality of sugarcane. There may be more factors to be taken into consideration, but the point is that the sugar factories should not be able to manipulate sugarcane prices they pay to their own advantage. Exactly how this is to be done is beyond our scope.

The possibility of backward shifting onto labour is dim in all the industries. This is because, in all the industries considered, minimum wage Acts are applicable, severely restricting the producers' ability to depress them or prevent the rise. Even non-wage payments to labour are to a great extent controlled by the government and periodically enquiries take place to properly check on the implementation of government directives. A relevant study here would be that by Rao,²⁵ which shows no backward shifting in 17 out of the 20 industries examined. Out of the seven industries selected by us, he analysed backward shifting in six, the one not examined being tea plantations. Out of the six examined, he finds that sugar and cement industries shift about 25 per cent of the tax backwards. In cotton textiles and iron and steel industries he finds a significant positive effect of the tax rate on wages and salaries. We have provided a theoretical basis for this phenomenon in section 2.10 of Chapter 2. The aluminium industry shows no significant effect of the tax on wages either way. These results are in no way incompatible with our results. If we accept these results and incorporate them in our results, the combined interpretation would be that 25 per cent out of the total shifting in sugar industry and the whole of the shifting in cement industry is achieved

25 V.G. Rao, "The Short-run Backward Shifting of Corporation Income Tax in India," Indian Journal of Economics, Vol. 53, April 1973, pp. 391-414.

through backward shifting. Thus, our estimated degrees of shifting, we assume, are primarily constituted by forward shifting. The variable affected, then, would be price and the group affected would be the consumers.

The most disturbing aspect would then be the very high degree of shifting in the iron and steel and sugar industries and the partial shifting in the paper industry, because these three industries are able to shift their tax burden (or at least part of it) despite the price and distribution controls clamped over them.

Of course, one might argue that it is not despite the controls, but because of the controls that they shift the tax. That is because the price-fixing agency would see to it that the firms get a minimum rate of return which is kept more or less constant at all times. This would obviously result in a high degree of shifting. However, this would be definitionally true only if the rate of return fixed was net of tax; if it is fixed gross of tax, then it would imply the opposite - zero shifting. And the fact is that they are fixed gross of tax. So this argument is not valid.

This means that the price-fixing agencies either allow for the shifting in the prices fixed (with or without 'pressure'), or the administration is not strict enough. In both cases, what is needed is a clear-cut directive from the government to the price-fixing agency, instructing them as to whether to include the rise in tax rate while fixing the

price or not. They must also be instructed as to be on the alert against disguising shifting in the garb of rise in other costs, which may be tried by the companies. Besides, toning up the administration of the pricing policies will be necessary. Companies in a controlled industry should not be able to shift the tax if the government does not endorse it, and this can be achieved through a very alert administration only.

As for the tea plantations, nothing can be done by the government to stop the tax shifting, short of clamping a price control on that industry too. Unless the government does not mind greater burden for the general consumer, the tax rate on the tea plantations should be reduced and the revenue loss should be made up in some other way. Whether price control is worthwhile or not can be found out only after the net aggregate disutility of shifting (i.e. the price rise due to the tax rate increase) is weighed against the net aggregate disutility of price controls.

One fact emerges clearly out of the discussion. A general tax policy for the whole corporate sector may not be in the best interest of the country, in view of the widely divergent shifting behaviours. Shifting is not only a matter of distribution, but of growth also. The shifting behaviour determines investment (and so expansion) in the industry and production also may be affected. If the product of that industry has a high cross-price-elasticity with respect to the product of some other industry, shifting affects the other

industry also. Therefore, the rational thing to do would be to ascertain at least broad industrywise shifting by going into the question in detail and reformulate the corporate tax policy accordingly. If necessary, there is no reason why different tax rates for different industry groups cannot be formulated in the lines of excise duty. Before any such step is taken, of course, a detailed study of the possible chain of effects have to be undertaken to decide the desirability of it. One obvious advantage, however, would be that the effects of the tax would conform more to what is expected, because the element of uncertainty due to unknown degrees of shifting will be absent. A shifted corporate income tax, to the extent it is shifted, is no different from an excise duty in any way. Hence, in the case of full shifting, the same revenue and other effects can be produced by suitably raising the excise on that industry and exempting the industry from corporate income tax. This would at least save some trouble for the companies and the income-tax authorities. Inter-firm differences can be brought in by linking the excise payable to profits earned, to maintain some sort of equity.

Another policy implication that emerges is that the argument of double taxation of dividends (once, before it is distributed, by corporate income tax, and then again, when it is distributed, by personal income tax) may be based on shaky presumption. To the extent the corporate income tax is shifted, it does not affect dividends adversely and hence the assertion

of double taxation crumbles down. This means that shareholders' demand for double taxation relief has to be viewed with circumspection by the tax authorities, keeping possible shifting in mind. But in this case also, differences in the degrees of shifting across industries would preclude a convenient general procedure.

APPENDIX TABLES

Notes on Data Given in Appendices A and B

All the financial data, as mentioned in the text, are from three sources, viz.:

- (i) "Finances of Indian Joint Stock Companies," Reserve Bank of India Bulletin, Vol. XVI, June and July 1962, pp. 840-870 and 1142-1179;
- (ii) Department of Statistics, Financial Statistics of Joint Stock Companies in India, 1960-61 to 1970-71, Reserve Bank of India, Bombay, 1973;
- (iii) Financial Statistics of Joint Stock Companies in India, 1970-71 to 1974-75, Reserve Bank of India, Bombay, 1978.

These data were not given in a uniform manner for the whole twenty-year period, and therefore necessitated some adjustments to bring them on a comparable level. This was done by adopting a particular definition of an item for all the years, and whenever the published data was not given as per the definition adopted by us, requisite adjustments were made.

For example, in the original sources the figures given against sales varied over the years. A few were net of excise duty, rebates and discounts, whereas others were not and the latter figures appeared in the expenditure side. We used sales figures net of excise duty, rebates and discounts throughout by making necessary adjustment. As far as possible, we have conformed to Reserve Bank of India definitions (latest)

of various items. These are given below for items which required any calculations over the published data.

(a) Net Worth: This is taken as share capital plus reserves and surplus. For the earlier ten years data for share capital was not available and figures for paid-up capital were used instead.

(b) Capital Employed: This is calculated as net fixed assets plus current assets minus current liabilities. Current assets were calculated as inventories plus loans and advances and other debtor balances, plus investments other than in shares and debentures of subsidiary companies, plus cash and bank balances. Current liabilities are calculated as other current provisions, plus tax provision net of advance of income tax (and excess profits tax), plus borrowings from banks, plus borrowings from other miscellaneous sources, plus trade dues and other current liabilities.

(c) Sales: This is net of excise duty and cess and rebates and discounts for periods beyond 1959-60. From 1955-56 to 1959-60, this is net of excise duty only because the figures for rebates and discounts are not available.

(d) Cost of Goods Sold: This is equal to raw materials consumed and other manufacturing expenses, plus salaries and wages, plus employees' welfare expenses, plus provident fund contributions, plus bad debts, plus managerial remunerations, plus 'other' (miscellaneous) expenses, minus net change in

value of stock of finished goods and work-in-progress.

(e) Cost of Production: This is equivalent to cost of goods sold, plus the net change in value of stock of finished goods and work-in-progress.

(f) Value of Production : This is sales plus net change in the value of the stock of finished goods and work-in-progress.

(g) Gross Profits: This is defined as profits before tax plus interest payments. For the years prior to 1960-61, it had to be calculated accordingly.

Table A.1 : Financial Data for Sample Companies: Tea Plantations

Year	Net Worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	(Rs. lakhs)			
								Gross Profits	Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	3,281	3,305	1,378	3,159	2,920	2,702	2,463	423	415	229	186
1956-57	3,353	3,391	1,459	3,267	3,333	2,499	2,565	720	701	324	377
1957-58	3,364	3,403	1,355	3,183	3,041	2,764	2,622	366	343	200	143
1958-59	3,473	3,509	1,329	3,300	3,253	2,766	2,719	467	435	227	208
1959-60	3,608	3,644	1,360	3,598	3,628	2,838	2,868	692	662	285	377
1960-61	3,353	3,372	1,350	3,199	3,280	2,508	2,589	599	567	259	308
1961-62	3,401	3,444	1,327	3,239	3,177	2,720	2,658	428	393	192	201
1962-63	3,471	3,509	1,409	3,309	3,368	2,682	2,741	524	480	269	211
1963-64	3,561	3,571	1,351	3,415	3,314	2,875	2,774	422	367	191	176
1964-65	3,646	3,658	1,472	3,429	3,541	2,818	2,930	484	424	221	203
1965-66	5,205	5,094	2,920	9,784	9,854	8,889	8,959	845	721	426	295
1966-67	5,365	5,300	3,093	10,127	10,305	9,205	9,383	944	794	427	368
1967-68	5,516	5,429	3,542	11,418	11,840	10,226	10,648	1,163	1,007	578	430
1968-69	5,782	5,709	3,399	11,610	11,428	10,835	10,653	763	590	371	219
1969-70	5,774	5,828	3,584	11,935	12,079	10,929	11,073	901	712	477	236
1970-71	6,149	6,432	4,594	13,902	14,783	12,438	13,319	1,400	1,224	622	602
1971-72	6,264	6,628	4,571	15,371	15,262	14,143	14,034	1,253	1,068	585	483
1972-73	6,308	6,646	4,626	15,786	15,680	14,680	14,574	1,207	1,013	618	394
1973-74	6,542	6,950	5,086	16,692	17,075	15,297	15,680	1,405	1,144	576	568
1974-75	7,460	8,008	7,243	22,033	23,463	18,840	20,270	3,207	2,835	1,651	1,184

Note: The sample sizes in the four quinquennial series were 136, 139, 135 and 127 companies.

Table A.2 : Financial Data for Sample Companies: Sugar

(Rs. lakhs)											
Year	Net Worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	Gross Profits	Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	3,616	3,879	4,758	6,292	7,732	5,404	6,844	722	585	298	287
1956-57	3,966	4,392	5,396	8,469	9,003	7,370	7,904	916	734	341	394
1957-58	4,127	4,616	5,465	9,699	9,619	8,481	8,401	999	785	395	390
1958-59	4,263	4,687	4,858	10,042	9,338	8,864	8,160	958	735	374	361
1959-60	4,630	5,001	5,314	10,176	10,478	8,848	9,150	1,152	938	386	552
1960-61	5,388	5,804	8,294	10,633	13,343	9,064	11,774	1,322	1,027	420	607
1961-62	5,667	6,112	9,911	12,770	14,281	11,259	12,770	1,240	819	406	413
1962-63	5,678	6,151	7,905	14,918	12,764	13,503	11,349	1,121	654	463	191
1963-64	5,862	6,280	5,528	15,546	13,044	13,773	11,271	1,475	1,116	656	460
1964-65	6,117	6,577	6,586	15,000	16,146	13,008	14,154	1,601	1,243	730	513
1965-66	5,759	5,902	7,575	13,578	16,242	11,878	14,542	1,640	1,226	607	619
1966-67	5,697	6,125	9,539	15,386	17,342	13,677	15,633	1,502	915	557	358
1967-68	5,879	6,052	6,483	16,461	13,265	15,076	11,880	1,079	437	336	101
1968-69	6,498	6,699	8,076	19,705	21,320	17,006	18,621	2,451	1,747	891	856
1969-70	6,932	7,108	12,167	21,390	25,488	19,071	23,169	1,988	1,269	752	517
1970-71	7,125	8,830	17,064	22,076	26,445	20,441	24,810	1,427	558	287	271
1971-72	7,618	9,157	15,899	27,535	26,168	24,525	23,158	2,596	1,230	481	749
1972-73	8,694	10,440	10,993	32,355	27,129	28,080	22,854	3,955	2,921	1,403	1,518
1973-74	9,597	11,993	14,193	32,148	34,700	29,486	32,038	3,088	2,221	1,180	1,040
1974-75	10,234	13,219	15,887	38,209	39,081	35,037	35,909	3,237	2,175	1,220	955

Note: The sample sizes for the four quinquennial series were 75, 82, 77 and 70.

Table A.3 : Financial Data for Sample Companies: Cotton Textiles

Year	Net worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	Gross Profits	(Rs. lakhs)		
									Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	15,426	15,865	10,887	37,340	36,224	33,722	32,606	2,701	2,367	862	1,504
1956-57	16,981	17,533	13,791	37,834	39,889	34,125	36,180	2,811	2,426	1,018	1,408
1957-58	16,258	17,042	15,149	38,125	39,680	36,395	37,950	1,016	434	626	-192
1958-59	15,984	16,716	13,973	39,894	39,323	37,833	37,262	1,460	749	680	69
1959-60	16,404	17,322	13,195	43,683	41,863	40,529	38,709	2,698	1,988	821	1,168
1960-61	21,498	22,960	18,584	57,060	58,976	49,869	51,785	5,454	4,538	1,568	2,970
1961-62	23,866	25,524	19,663	63,382	63,806	55,100	55,524	6,497	5,470	2,278	3,192
1962-63	24,844	26,558	21,465	64,680	66,487	58,451	60,258	4,395	3,255	1,777	1,478
1963-64	25,978	28,423	22,263	73,779	72,540	66,068	64,829	5,219	3,702	1,839	1,863
1964-65	26,888	29,621	25,280	77,861	80,492	69,399	72,030	5,702	3,856	1,772	2,084
1965-66	24,191	26,163	24,312	70,913	72,448	66,314	67,849	3,461	1,295	975	320
1966-67	25,126	28,291	23,646	78,744	79,029	72,286	72,571	5,275	2,663	1,342	1,321
1967-68	25,250	28,639	28,522	86,468	89,085	79,835	82,452	4,699	1,657	1,049	608
1968-69	25,090	28,603	30,747	95,656	96,809	89,406	90,559	4,205	720	776	-57
1969-70	26,635	30,078	31,871	105,375	105,570	96,660	96,855	6,465	2,885	1,179	1,705
1970-71	28,682	42,113	32,074	103,917	106,638	95,309	98,030	7,027	3,784	1,515	2,269
1971-72	29,274	44,661	36,352	116,865	119,836	109,504	112,475	6,553	2,511	1,334	1,178
1972-73	31,398	50,656	40,280	133,348	132,298	122,318	121,268	9,460	4,814	1,587	3,227
1973-74	38,029	60,026	48,532	151,382	154,354	133,137	136,109	16,884	12,458	4,168	8,291
1974-75	42,148	66,249	56,314	183,959	192,760	169,460	178,261	13,757	8,521	3,514	5,007

Note: The sample sizes for the four quinquennial series were 212, 256, 261 and 249.

Table A.4 : Financial Data for Sample Companies: Iron and Steel

Year	Net Worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	(Rs. lakhs)			
								Gross Profits	Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	5,092	5,763	1,998	7,287	7,242	5,253	5,208	1,820	1,771	656	1,115
1956-57	6,603	8,460	2,219	7,741	7,772	5,829	5,860	1,723	1,661	698	963
1957-58	8,498	13,865	3,304	7,919	8,209	6,193	6,483	1,468	1,248	293	955
1958-59	9,114	16,095	4,105	9,534	9,656	7,568	7,690	1,532	1,124	36	1,088
1959-60	10,276	17,405	4,394	12,516	12,549	9,615	9,648	2,062	1,508	64	1,444
1960-61	11,212	18,006	4,660	12,738	13,002	9,530	9,794	1,870	1,420	166	1,254
1961-62	11,708	17,682	4,906	13,722	13,643	10,359	10,280	2,065	1,611	396	1,215
1962-63	13,648	18,018	5,125	14,858	14,947	11,217	11,306	2,510	2,099	436	1,663
1963-64	14,017	18,725	5,411	16,119	16,187	12,223	12,291	3,202	2,859	862	1,997
1964-65	14,532	18,814	5,420	16,655	16,736	12,620	12,701	3,109	2,621	1,069	1,552
1965-66	15,372	20,316	5,956	16,690	16,945	13,002	13,257	2,783	2,449	1,141	1,308
1966-67	15,713	21,566	6,424	16,155	16,602	13,226	13,673	1,910	1,525	608	918
1967-68	15,971	20,672	6,761	16,415	16,730	13,900	14,215	1,432	899	265	634
1968-69	16,267	19,977	6,136	18,728	18,121	15,791	15,184	1,823	1,309	414	895
1969-70	16,441	19,100	5,983	18,958	19,098	16,073	16,213	1,767	1,311	524	787
1970-71	16,894	19,028	6,673	20,408	20,383	16,813	16,788	2,261	1,807	716	1,091
1971-72	16,932	18,503	8,014	21,058	21,469	17,971	18,382	1,805	1,114	580	534
1972-73	16,488	19,313	8,550	21,784	21,867	19,940	20,023	644	-28	-	-28
1973-74	16,792	22,196	10,917	22,098	23,869	18,859	20,630	2,090	1,074	445	629
1974-75	17,919	24,894	14,318	30,888	32,140	25,772	27,024	4,195	2,902	1,280	1,622

Note: (i) The sample size has remained constant over the whole twenty-year period at 2.

(ii) Data for 1972-73 were not used in our analysis.

Table A.5 : Financial Data for Sample Companies: Aluminium

(Rs. lakhs)											
Year	Net Worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	Gross Profits	Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	600	659	257	667	693	566	592	69	55	3	52
1956-57	675	706	303	846	860	722	736	85	72	14	58
1957-58	764	1,010	428	1,019	1,072	862	915	115	99	57	42
1958-59	993	1,027	421	1,208	1,186	988	966	178	159	88	71
1959-60	1,092	1,427	502	1,438	1,485	1,108	1,155	263	240	82	158
1960-61	1,080	1,411	373	1,243	1,249	907	913	285	257	112	145
1961-62	1,230	1,591	465	1,127	1,139	797	809	276	233	65	168
1962-63	1,362	1,813	545	1,264	1,323	828	887	323	267	60	207
1963-64	1,590	2,184	617	1,701	1,723	1,082	1,104	485	424	216	208
1964-65	1,896	2,489	654	1,814	1,774	1,089	1,049	573	521	258	263
1965-66	4,000	5,412	1,365	3,225	3,182	1,830	1,787	1,011	864	186	678
1966-67	4,611	7,095	1,656	4,402	4,568	2,786	2,952	1,111	867	147	720
1967-68	5,202	7,595	1,899	5,162	5,292	3,358	3,488	1,227	944	274	670
1968-69	6,149	8,422	2,041	5,716	5,880	3,988	4,152	1,886	845	199	646
1969-70	7,084	9,029	2,556	6,907	7,024	4,831	4,948	1,635	1,273	59	1,214
1970-71	7,748	11,187	2,465	8,234	8,228	5,722	5,716	2,006	1,669	1	1,668
1971-72	8,542	11,934	3,102	8,419	8,645	5,998	6,224	1,756	1,480	192	1,288
1972-73	8,954	12,463	3,515	8,924	8,881	6,457	6,414	1,658	1,263	433	830
1973-74	8,898	12,601	3,278	8,025	8,344	6,361	6,680	879	487	252	235
1974-75	9,124	12,145	4,162	9,374	9,641	7,752	8,019	417	-66	82	-148

Note: (i) The sample sizes for the four quinquennial series were 3, 2, 4 and 3.

(ii) The data for 1974-75 were not used in our analysis.

Table A.6 : Financial Data for Sample Companies: Paper and Paper Products

Year	Net Worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	(Rs. Lakhs)			
								Gross Profits	Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	2,056	2,416	640	2,263	2,262	1,804	1,803	367	333	125	208
1956-57	2,162	2,513	711	2,516	2,476	2,047	2,007	344	309	172	137
1957-58	2,305	2,667	912	2,805	2,789	2,245	2,229	377	338	165	173
1958-59	2,507	2,894	1,039	3,339	3,355	2,640	2,656	551	493	223	270
1959-60	2,700	3,121	1,129	3,889	3,898	3,113	3,122	588	526	193	334
1960-61	3,510	4,121	1,351	4,304	4,362	3,443	3,501	591	513	164	349
1961-62	3,825	4,389	1,307	4,692	4,686	3,875	3,869	579	492	187	305
1962-63	4,235	4,932	1,799	5,180	5,233	4,259	4,312	673	564	263	301
1963-64	4,650	6,239	2,166	6,081	6,109	4,889	4,917	786	623	214	409
1964-65	4,886	6,516	2,328	6,332	6,428	5,087	5,183	739	493	200	293
1965-66	6,229	8,350	2,940	8,141	8,217	6,622	6,698	866	465	180	285
1966-67	6,584	9,519	3,075	9,075	9,119	7,451	7,495	1,136	628	190	438
1967-68	6,700	9,751	3,335	9,420	9,467	7,962	8,009	974	402	153	249
1968-69	7,017	10,313	3,543	10,706	10,727	9,018	9,039	1,218	594	134	461
1969-70	7,960	11,072	3,835	12,908	12,866	10,313	10,271	1,959	1,344	209	1,135
1970-71	9,390	12,766	4,396	15,007	15,010	11,698	11,701	2,506	1,743	355	1,388
1971-72	10,408	13,590	5,136	16,900	17,099	13,283	13,482	2,850	2,195	517	1,678
1972-73	10,996	14,198	5,902	17,991	17,957	14,584	14,550	2,470	1,794	455	1,339
1973-74	11,816	15,566	6,562	19,935	20,095	16,198	16,358	2,868	2,115	681	1,434
1974-75	14,702	18,594	8,894	29,113	30,148	20,859	21,894	7,124	5,981	2,859	3,122

Note: The sample sizes for the four quinquennial series were 18, 20, 30 and 36.

Table A.7 : Financial Data for Sample Companies: Cement

Year	(Rs. lakhs)										
	Net Worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	Gross Profits	Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	3,163	3,121	1,070	3,326	3,345	2,494	2,513	650	633	274	359
1956-57	3,406	3,523	1,381	3,407	3,462	2,674	2,729	558	523	167	355
1957-58	3,995	4,154	2,022	3,772	3,828	2,998	3,054	528	466	173	294
1958-59	4,571	4,602	2,261	4,141	4,202	3,287	3,348	574	483	239	244
1959-60	4,772	4,808	1,918	4,651	4,721	3,677	3,747	638	522	133	389
1960-61	5,374	5,434	1,943	5,760	5,711	4,594	4,545	738	607	186	420
1961-62	5,612	5,613	2,332	6,439	6,522	5,116	5,199	857	715	265	450
1962-63	5,976	5,992	2,578	7,469	7,444	5,866	5,841	1,192	1,041	478	563
1963-64	6,237	6,299	3,012	7,846	7,846	6,298	6,298	1,172	998	423	575
1964-65	6,308	6,414	3,137	8,526	8,582	6,797	6,853	1,230	1,015	468	547
1965-66	6,610	6,717	3,410	9,473	9,479	7,535	7,541	1,470	1,197	459	738
1966-67	7,234	7,899	3,977	12,353	12,429	9,669	9,745	2,147	1,794	715	1,079
1967-68	7,824	9,025	4,775	13,456	13,675	10,879	11,098	2,030	1,621	656	965
1968-69	8,194	10,485	4,920	13,191	13,383	11,129	11,321	1,480	978	290	688
1969-70	9,276	11,761	5,147	15,011	15,255	12,419	12,663	1,860	1,268	296	972
1970-71	10,792	13,450	5,687	17,820	17,848	14,694	14,722	2,291	1,635	358	1,277
1971-72	11,121	13,654	6,237	19,106	19,316	15,845	16,055	2,346	1,628	582	1,046
1972-73	11,070	13,373	6,799	19,482	19,540	17,150	17,208	1,559	865	348	517
1973-74	10,468	12,694	7,366	19,403	19,607	17,913	18,117	712	-112	126	-237
1974-75	9,917	12,963	8,095	22,094	22,023	20,525	20,454	846	52	287	-235

Note: (i) The sample sizes for the four quinquennial series were 12, 16, 16 and 18.

(ii) The data for the year 1973-74 were not used in our analysis.

Table A.8 : Financial Data for Sample Companies: Whole Corporate Sector

(Rs. lakhs)											
Year	Net Worth	Capital Employed	Inventories	Sales	Value of Production	Cost of Goods Sold	Cost of Production	Gross Profits	Profits Before Tax	Tax Provision	Profits After Tax
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	75,395	82,267	42,587	138,364	139,420	122,326	123,382	13,186	11,852	5,038	6,814
1956-57	82,562	91,766	51,974	153,799	158,943	136,002	141,146	14,789	13,131	5,883	7,248
1957-58	87,640	101,885	57,186	165,152	167,645	148,580	151,073	13,273	10,870	5,182	5,688
1958-59	92,113	109,150	57,707	171,763	170,889	153,202	152,328	15,073	12,260	5,656	6,604
1959-60	98,610	116,207	59,219	188,495	187,347	165,276	164,128	19,380	16,341	5,972	10,369
1960-61	121,377	138,617	78,745	238,963	248,617	207,002	216,656	25,466	21,755	8,393	13,362
1961-62	131,154	149,022	87,317	263,421	266,881	228,874	232,334	27,668	23,302	10,185	13,117
1962-63	139,923	157,641	94,838	288,353	290,465	250,520	252,632	30,516	25,573	13,378	12,195
1963-64	149,784	170,749	102,057	322,118	321,899	278,840	278,621	34,901	28,992	14,790	14,202
1964-65	159,058	182,428	111,989	352,302	359,900	305,120	312,718	37,272	29,965	15,140	14,825
1965-66	187,022	207,750	138,108	408,113	417,888	354,820	364,595	43,507	33,334	16,661	16,673
1966-67	199,577	231,428	154,925	456,470	465,699	398,423	407,652	47,773	34,888	16,683	18,204
1967-68	209,053	243,610	169,973	493,125	499,034	436,125	442,034	45,419	30,008	14,827	15,181
1968-69	220,049	255,598	173,963	535,266	540,330	475,977	481,041	47,289	30,508	15,099	15,409
1969-70	235,553	270,557	187,501	595,015	602,027	524,999	532,011	57,074	39,743	17,349	22,394
1970-71	267,859	369,797	221,108	690,951	705,384	602,322	616,755	73,530	53,264	22,247	31,017
1971-72	286,513	394,329	250,030	774,872	787,485	680,247	692,860	79,921	56,503	25,584	30,920
1972-73	305,960	426,056	264,451	859,776	858,098	761,255	759,577	83,580	59,847	28,003	31,844
1973-74	332,094	467,479	305,064	935,563	954,625	820,955	840,017	99,740	74,019	35,451	38,568
1974-75	381,311	528,206	392,202	1183,269	1230,367	1034,711	1081,809	134,627	101,283	49,166	52,117

Note: The sample sizes for the four quinquennial series were 1001, 1333, 1501 and 1650.

Table B.1 : Financial Ratios: Tea Plantations

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.5518	0.0698	0.9927	0.4362	0.8553	0.8435	0.9558	0.1280	0.1265	0.0567
1956-57	0.4622	0.0967	0.9888	0.4466	0.7649	0.7696	0.9634	0.2123	0.2091	0.1124
1957-58	0.5831	0.0595	0.9885	0.4257	0.8684	0.8622	0.9354	0.1076	0.1020	0.0425
1958-59	0.5218	0.0654	0.9897	0.4027	0.8382	0.8358	0.9404	0.1331	0.1253	0.0599
1959-60	0.4305	0.0790	0.9901	0.3780	0.7888	0.7905	0.9874	0.1899	0.1835	0.1045
1960-61	0.4568	0.0772	0.9944	0.4220	0.7840	0.7893	0.9487	0.1776	0.1691	0.0919
1961-62	0.4885	0.0565	0.9875	0.4098	0.8398	0.8366	0.9405	0.1243	0.1156	0.0591
1962-63	0.5604	0.0775	0.9892	0.4258	0.8105	0.8138	0.9430	0.1493	0.1383	0.0608
1963-64	0.5204	0.0537	0.9972	0.3956	0.8419	0.8371	0.9563	0.1182	0.1031	0.0494
1964-65	0.5212	0.0606	0.9967	0.4293	0.8218	0.8274	0.9374	0.1323	0.1163	0.0557
1965-66	0.5908	0.0818	1.0218	0.2984	0.9085	0.9092	1.9207	0.1659	0.1385	0.0567
1966-67	0.5378	0.0794	1.0123	0.3054	0.9090	0.9105	1.9108	0.1781	0.1480	0.0686
1967-68	0.5740	0.1046	1.0160	0.3102	0.8956	0.8993	2.1031	0.2142	0.1826	0.0780
1968-69	0.6288	0.0641	1.0128	0.2928	0.9332	0.9322	2.0336	0.1336	0.1020	0.0379
1969-70	0.6699	0.0826	0.9907	0.3003	0.9157	0.9167	2.0479	0.1546	0.1233	0.0409
1970-71	0.5082	0.1012	0.9560	0.3305	0.8947	0.9010	2.1614	0.2177	0.1991	0.0979
1971-72	0.5477	0.0934	0.9451	0.2974	0.9201	0.9195	2.3191	0.1890	0.1705	0.0771
1972-73	0.6101	0.0981	0.9491	0.2930	0.9299	0.9295	2.3753	0.1816	0.1606	0.0625
1973-74	0.5035	0.0871	0.9413	0.3047	0.9164	0.9183	2.4017	0.2022	0.1749	0.0868
1974-75	0.5824	0.2213	0.9316	0.3287	0.8551	0.8639	2.7514	0.4005	0.3800	0.1587

Table B.2 : Financial Ratios: Sugar

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net Worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.5094	0.0824	0.9322	0.7562	0.8589	0.8852	1.6221	0.1861	0.1618	0.0794
1956-57	0.4646	0.0860	0.9030	0.6371	0.8702	0.8779	1.9283	0.2085	0.1851	0.0993
1957-58	0.5032	0.0957	0.8941	0.5635	0.8744	0.8734	2.1012	0.2164	0.1902	0.0945
1958-59	0.5088	0.0877	0.9095	0.4838	0.8827	0.8738	2.1425	0.2044	0.1724	0.0847
1959-60	0.4115	0.0834	0.9258	0.5222	0.8695	0.8733	2.0348	0.2304	0.2026	0.1192
1960-61	0.4090	0.0780	0.9283	0.7800	0.8524	0.8824	1.8320	0.2278	0.1906	0.1127
1961-62	0.4957	0.0716	0.9272	0.7761	0.8817	0.8942	2.0893	0.2029	0.1445	0.0729
1962-63	0.7080	0.0815	0.9231	0.5299	0.9051	0.8891	2.4253	0.1822	0.1152	0.0336
1963-64	0.5878	0.1119	0.9334	0.3556	0.8860	0.8641	2.4755	0.2349	0.1904	0.0785
1964-65	0.5873	0.1193	0.9301	0.4391	0.8672	0.8766	2.2807	0.2434	0.2032	0.0839
1965-66	0.4951	0.1054	0.9758	0.5579	0.8748	0.8953	2.3006	0.2779	0.2129	0.1075
1966-67	0.6087	0.0978	0.9301	0.6200	0.8889	0.9015	2.5120	0.2452	0.1606	0.0628
1967-68	0.7689	0.0572	0.9714	0.3938	0.9159	0.8956	2.7199	0.1783	0.0743	0.0172
1968-69	0.5100	0.1371	0.9700	0.4098	0.8630	0.8734	2.9415	0.3659	0.2689	0.1317
1969-70	0.5926	0.1085	0.9752	0.5688	0.8916	0.9090	3.0093	0.2797	0.1831	0.0746
1970-71	0.5143	0.0403	0.8069	0.7730	0.9259	0.9382	2.5001	0.1616	0.0783	0.0380
1971-72	0.3911	0.0631	0.8319	0.5774	0.8907	0.8850	3.0070	0.2835	0.1615	0.0983
1972-73	0.4803	0.1614	0.8328	0.3398	0.8679	0.8424	3.0991	0.3788	0.3360	0.1746
1973-74	0.5313	0.1230	0.8002	0.4415	0.9172	0.9233	2.6806	0.2575	0.2314	0.1084
1974-75	0.5609	0.1192	0.7742	0.4158	0.9170	0.9188	2.8905	0.2449	0.2125	0.0933

Table B.3 : Financial Ratios: Cotton Textiles

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net Worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.3642	0.0559	0.9723	0.2916	0.9031	0.9001	2.3536	0.1702	0.1534	0.0975
1956-57	0.4196	0.0599	0.9685	0.3645	0.9020	0.9070	2.1579	0.1603	0.1429	0.0829
1957-58	1.4424	0.0385	0.9540	0.3974	0.9546	0.9564	2.2371	0.0596	0.0267	-0.0118
1958-59	0.9079	0.0425	0.9562	0.3503	0.9483	0.9476	2.3866	0.0873	0.0469	0.0043
1959-60	0.4130	0.0500	0.9470	0.3021	0.9278	0.9247	2.5218	0.1558	0.1212	0.0712
1960-61	0.3455	0.0729	0.9363	0.3257	0.8740	0.8781	2.4852	0.2375	0.2111	0.1382
1961-62	0.4165	0.0954	0.9350	0.3102	0.8693	0.8702	2.4832	0.2545	0.2292	0.1337
1962-63	0.5460	0.0715	0.9355	0.3319	0.9037	0.9063	2.4354	0.1655	0.1310	0.0595
1963-64	0.4968	0.0708	0.9140	0.3018	0.8955	0.8937	2.5957	0.1942	0.1425	0.0717
1964-65	0.4595	0.0659	0.9077	0.3247	0.8913	0.8949	2.6286	0.1925	0.1434	0.0775
1965-66	0.7529	0.0403	0.9246	0.3428	0.9351	0.9365	2.7104	0.1323	0.0535	0.0132
1966-67	0.5039	0.0534	0.8881	0.3003	0.9180	0.9183	2.7834	0.1865	0.1060	0.0526
1967-68	0.6331	0.0415	0.8817	0.3299	0.9233	0.9255	3.0192	0.1641	0.0656	0.0241
1968-69	1.0778	0.0309	0.8772	0.3214	0.9347	0.9354	3.3443	0.1470	0.0287	-0.0023
1969-70	0.4087	0.0443	0.8855	0.3025	0.9173	0.9174	3.5034	0.2149	0.1083	0.0640
1970-71	0.4004	0.0528	0.6811	0.3087	0.9172	0.9193	2.4676	0.1669	0.1319	0.0791
1971-72	0.5313	0.0456	0.6555	0.3111	0.9370	0.9386	2.6167	0.1467	0.0859	0.0402
1972-73	0.3297	0.0505	0.6198	0.3021	0.9173	0.9166	2.6324	0.1867	0.1533	0.1028
1973-74	0.3346	0.1096	0.6335	0.3206	0.8795	0.8818	2.5219	0.2813	0.3276	0.2180
1974-75	0.4124	0.0834	0.6362	0.3061	0.9212	0.9248	2.7768	0.2077	0.2022	0.1188

Table B.4 : Financial Ratios: Iron and Steel

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net Worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.3704	0.1288	0.8836	0.2742	0.7209	0.7191	1.2644	0.3158	0.3478	0.2190
1956-57	0.4202	0.1057	0.7805	0.2867	0.7530	0.7540	0.9150	0.2037	0.2516	0.1458
1957-58	0.2348	0.0345	0.6129	0.4172	0.7820	0.7897	0.5712	0.1059	0.1469	0.1124
1958-59	0.0320	0.0039	0.5663	0.4306	0.7938	0.7964	0.5924	0.0952	0.1233	0.1194
1959-60	0.0424	0.0062	0.5904	0.3511	0.7682	0.7688	0.7191	0.1185	0.1467	0.1405
1960-61	0.1169	0.0148	0.6227	0.3658	0.7482	0.7533	0.7074	0.1039	0.1267	0.1118
1961-62	0.2458	0.0338	0.6621	0.3575	0.7549	0.7535	0.7760	0.1168	0.1376	0.1038
1962-63	0.2077	0.0319	0.7575	0.3449	0.7549	0.7564	0.8246	0.1393	0.1538	0.1218
1963-64	0.3015	0.0615	0.7486	0.3357	0.7583	0.7593	0.8608	0.1710	0.2040	0.1425
1964-65	0.4079	0.0736	0.7724	0.3254	0.7577	0.7589	0.8852	0.1652	0.1804	0.1068
1965-66	0.4659	0.0742	0.7566	0.3569	0.7790	0.7824	0.8215	0.1370	0.1593	0.0851
1966-67	0.3987	0.0387	0.7286	0.3976	0.8187	0.8236	0.7491	0.0886	0.0971	0.0584
1967-68	0.2948	0.0166	0.7726	0.4119	0.8468	0.8497	0.7941	0.0693	0.0563	0.0397
1968-69	0.3163	0.0255	0.8143	0.3276	0.8432	0.8379	0.9375	0.0913	0.0805	0.0550
1969-70	0.3997	0.0319	0.8608	0.3156	0.8478	0.8489	0.9926	0.0925	0.0797	0.0479
1970-71	0.3962	0.0424	0.8878	0.3270	0.8238	0.8236	1.0725	0.1188	0.1070	0.0645
1971-72	0.5206	0.0343	0.9151	0.3806	0.8534	0.8562	1.1381	0.0976	0.0658	0.0315
1972-73	-	-	0.8537	0.3925	0.9154	0.9596	1.1279	0.0333	-0.0017	-0.0017
1973-74	0.4143	0.0265	0.7565	0.4940	0.8534	0.8643	0.9956	0.0942	0.0640	0.0375
1974-75	0.4411	0.0714	0.7198	0.4635	0.8344	0.8408	1.2408	0.1685	0.1620	0.0985

Table B.5 : Financial Ratios: Aluminium

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net Worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.0545	0.0050	0.9105	0.3853	0.8486	0.8543	1.0121	0.1047	0.0917	0.0867
1956-57	0.1944	0.0208	0.9561	0.3582	0.8534	0.8558	1.1983	0.1204	0.1067	0.0859
1957-58	0.5758	0.0591	0.9545	0.4200	0.8459	0.8535	1.0089	0.1139	0.1027	0.0436
1958-59	0.5535	0.0886	0.9669	0.3485	0.8179	0.8145	1.1762	0.1733	0.1601	0.0715
1959-60	0.3417	0.0751	0.7652	0.3491	0.7705	0.7778	1.0077	0.1843	0.2198	0.1447
1960-61	0.4358	0.1037	0.7654	0.3001	0.7297	0.7310	0.8809	0.2020	0.2380	0.1343
1961-62	0.2790	0.0528	0.7731	0.4126	0.7072	0.7103	0.7084	0.1817	0.1894	0.1366
1962-63	0.2247	0.0440	0.7512	0.4312	0.6551	0.6704	0.6972	0.1782	0.1960	0.1520
1963-64	0.5094	0.1359	0.7280	0.3627	0.6361	0.6407	0.7788	0.2221	0.2667	0.1308
1964-65	0.4952	0.1361	0.7618	0.3605	0.6003	0.5913	0.7288	0.2302	0.2748	0.1387
1965-66	0.2153	0.0465	0.7391	0.4233	0.5674	0.5616	0.5959	0.1868	0.2160	0.1695
1966-67	0.1696	0.0319	0.6499	0.3762	0.6329	0.6462	0.6204	0.1566	0.1880	0.1561
1967-68	0.2903	0.0527	0.6849	0.3679	0.6505	0.6591	0.6797	0.1616	0.1815	0.1288
1968-69	0.2355	0.0323	0.7301	0.3570	0.6977	0.7061	0.6787	0.1408	0.1374	0.1051
1969-70	0.0463	0.0083	0.7846	0.3701	0.6994	0.7044	0.7650	0.1811	0.1797	0.1714
1970-71	0.0006	0.0001	0.6926	0.2994	0.6949	0.6947	0.7360	0.1793	0.2154	0.2153
1971-72	0.1297	0.0225	0.7158	0.3685	0.7124	0.7200	0.7055	0.1471	0.1733	0.1508
1972-73	0.3428	0.0483	0.7184	0.3939	0.7236	0.7222	0.7478	0.1330	0.1410	0.0927
1973-74	0.5175	0.0283	0.7061	0.4085	0.7926	0.8006	0.6368	0.0698	0.0547	0.0264
1974-75	-	0.0090	0.7513	0.4440	0.8270	0.8318	0.7718	0.0343	-0.0072	-0.0162

Table B.6 : Financial Ratios: Paper and Paper Products

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net Worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.3754	0.0608	0.8510	0.2828	0.7972	0.7971	0.9367	0.1519	0.1620	0.1012
1956-57	0.5566	0.0796	0.8603	0.2826	0.8136	0.8106	1.0012	0.1369	0.1429	0.0634
1957-58	0.4882	0.0716	0.8643	0.3251	0.8004	0.7992	1.0517	0.1414	0.1466	0.0751
1958-59	0.4523	0.0890	0.8663	0.3112	0.7907	0.7917	1.1538	0.1904	0.1966	0.1077
1959-60	0.3669	0.0715	0.8651	0.2903	0.8005	0.8009	1.2461	0.1884	0.1948	0.1237
1960-61	0.3197	0.0467	0.8517	0.3139	0.8000	0.8026	1.0444	0.1434	0.1462	0.0994
1961-62	0.3801	0.0489	0.8715	0.2786	0.8259	0.8257	1.0690	0.1319	0.1286	0.0797
1962-63	0.4663	0.0621	0.8587	0.3473	0.8222	0.8240	1.0503	0.1365	0.1332	0.0711
1963-64	0.3435	0.0460	0.7453	0.3562	0.8040	0.8049	0.9747	0.1260	0.1340	0.0880
1964-65	0.4057	0.0409	0.7498	0.3677	0.8034	0.8063	0.9718	0.1134	0.1009	0.0600
1965-66	0.3871	0.0289	0.7460	0.3611	0.8134	0.8151	0.9750	0.1037	0.0747	0.0458
1966-67	0.3025	0.0289	0.6917	0.3388	0.8210	0.8219	0.9534	0.1193	0.0954	0.0665
1967-68	0.3806	0.0228	0.6871	0.3540	0.8452	0.8460	0.9661	0.0999	0.0600	0.0372
1968-69	0.2256	0.0191	0.6804	0.3309	0.8423	0.8426	1.0381	0.1181	0.0847	0.0657
1969-70	0.1555	0.0263	0.7189	0.2971	0.7990	0.7983	1.1658	0.1769	0.1688	0.1426
1970-71	0.2037	0.0379	0.7355	0.2929	0.7795	0.7795	1.1755	0.1963	0.1856	0.1478
1971-72	0.2355	0.0497	0.7659	0.3039	0.7860	0.7885	1.2436	0.2097	0.2109	0.1612
1972-73	0.2356	0.0414	0.7755	0.3281	0.8106	0.8103	1.2672	0.1740	0.1632	0.1218
1973-74	0.3220	0.0576	0.7591	0.3292	0.8125	0.8140	1.2807	0.1842	0.1790	0.1214
1974-75	0.4780	0.1945	0.7907	0.3055	0.7165	0.7262	1.5657	0.3831	0.4068	0.2124

Table B.7 : Financial Ratios: Cement

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net Worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.4329	0.0866	1.0135	0.3217	0.7498	0.7513	1.0657	0.2083	0.2001	0.1135
1956-57	0.3193	0.0494	0.9668	0.4053	0.7849	0.7883	0.9671	0.1584	0.1536	0.1042
1957-58	0.3712	0.0430	0.9617	0.5361	0.7948	0.7978	0.9080	0.1271	0.1166	0.0736
1958-59	0.4948	0.0523	0.9933	0.5460	0.7938	0.7968	0.8998	0.1247	0.1057	0.0534
1959-60	0.2548	0.0279	0.9925	0.4124	0.7906	0.7937	0.9673	0.1327	0.1094	0.0815
1960-61	0.3064	0.0348	0.9890	0.3373	0.7976	0.7958	1.0600	0.1358	0.1130	0.0782
1961-62	0.3706	0.0472	0.9998	0.3622	0.7945	0.7971	1.1472	0.1527	0.1274	0.0802
1962-63	0.4592	0.0800	0.9973	0.3452	0.7854	0.7847	1.2465	0.1989	0.1742	0.0942
1963-64	0.4238	0.0678	0.9902	0.3839	0.8027	0.8027	1.2456	0.1861	0.1600	0.0922
1964-65	0.4611	0.0742	0.9835	0.3679	0.7972	0.7985	1.3293	0.1918	0.1609	0.0867
1965-66	0.3835	0.0695	0.9841	0.3600	0.7954	0.7955	1.4103	0.2188	0.1811	0.1116
1966-67	0.3986	0.0988	0.9158	0.3219	0.7827	0.7841	1.5639	0.2718	0.2480	0.1492
1967-68	0.4047	0.0839	0.8669	0.3549	0.8085	0.8116	1.4910	0.2249	0.2072	0.1233
1968-69	0.2965	0.0354	0.7815	0.3730	0.8437	0.8459	1.2581	0.1412	0.1194	0.0840
1969-70	0.2334	0.0319	0.7887	0.3429	0.8273	0.8301	1.2763	0.1581	0.1367	0.1048
1970-71	0.2190	0.0332	0.8024	0.3191	0.8246	0.8249	1.3249	0.1703	0.1515	0.1183
1971-72	0.3575	0.0523	0.8145	0.3264	0.8293	0.8312	1.3993	0.1718	0.1464	0.0941
1972-73	0.4023	0.0314	0.8278	0.3490	0.8803	0.8807	1.4568	0.1166	0.0781	0.0467
1973-74	-	0.0119	0.8246	0.3796	0.9232	0.9240	1.5285	0.0561	-0.0107	-0.0226
1974-75	5.5192	0.0289	0.7650	0.3664	0.9290	0.9288	1.7044	0.0653	0.0052	-0.0237

Table B.8 : Financial Ratios: Whole Corporate Sector

Year	Tax Provision/Profits Before Tax	Tax Provision/Net Worth	Net Worth/Capital Employed	Inventories/Sales	Cost of Goods Sold/Sales	Cost of Production/Value of Production	Sales/Capital Employed	Gross Profits/Capital Employed	Profits Before Tax/Net Worth	Profits After Tax/Net Worth
1	2	3	4	5	6	7	8	9	10	11
1955-56	0.4251	0.0668	0.9165	0.3078	0.8841	0.8850	1.6819	0.1603	0.1572	0.0904
1956-57	0.4480	0.0713	0.8997	0.3379	0.8843	0.8880	1.6760	0.1612	0.1590	0.0878
1957-58	0.4767	0.0591	0.8602	0.3463	0.8997	0.9011	1.6210	0.1303	0.1240	0.0649
1958-59	0.4613	0.0614	0.8439	0.3360	0.8919	0.8914	1.5736	0.1381	0.1331	0.0717
1959-60	0.3655	0.0606	0.8486	0.3142	0.8768	0.8761	1.6221	0.1668	0.1657	0.1052
1960-61	0.3858	0.0691	0.8756	0.3295	0.8663	0.8714	1.7239	0.1837	0.1792	0.1101
1961-62	0.4371	0.0777	0.8801	0.3315	0.8689	0.8706	1.7677	0.1857	0.1777	0.1000
1962-63	0.5231	0.0956	0.8876	0.3289	0.8688	0.8698	1.8292	0.1936	0.1828	0.0872
1963-64	0.5101	0.0937	0.8772	0.3168	0.8656	0.8656	1.8865	0.2044	0.1936	0.0948
1964-65	0.5053	0.0952	0.8719	0.3179	0.8661	0.8689	1.9312	0.2043	0.1884	0.0932
1965-66	0.4998	0.0891	0.9002	0.3384	0.8694	0.8725	1.9644	0.2094	0.1782	0.0891
1966-67	0.4782	0.0836	0.8624	0.3394	0.8728	0.8754	1.9724	0.2064	0.1748	0.0912
1967-68	0.4941	0.0709	0.8581	0.3447	0.8844	0.8858	2.0242	0.1864	0.1435	0.0726
1968-69	0.4949	0.0686	0.8609	0.3250	0.8892	0.8903	2.0942	0.1850	0.1386	0.0700
1969-70	0.4365	0.0737	0.8706	0.3151	0.8823	0.8837	2.1992	0.2110	0.1687	0.0951
1970-71	0.4177	0.0831	0.7243	0.3200	0.8717	0.8744	1.8685	0.1988	0.1989	0.1158
1971-72	0.4528	0.0893	0.7266	0.3227	0.8779	0.8798	1.9650	0.2027	0.1972	0.1079
1972-73	0.4679	0.0915	0.7181	0.3076	0.8854	0.8852	2.0180	0.1962	0.1956	0.1041
1973-74	0.4789	0.1067	0.7104	0.3261	0.8775	0.8799	2.0013	0.2134	0.2229	0.1161
1974-75	0.4854	0.1289	0.7219	0.3315	0.8745	0.8793	2.2402	0.2549	0.2656	0.1367

Table C.1 : Tea Plantations in India, 1955-75

(Production in Thousand Kg.)

Year	1 Total No. of Estates (All India)	2 Area Under Tea Plant- ation (All India) (Ha.)	3 Produ- tion (Thou- sand Kg.) (All- India)	4 Average Produ- ctivity Kg./Ha.	5 ^a Number and Production of tea-estates in various size-groups											
					Size Group I (Below 5 Ha.) (Below 10 Acres) ^b		Size Group II (5 to 50 Ha.) (10 to 150 Acres) ^b		Size Group III (50 to 100 Ha.) (150 to 300 Acres) ^b		Size Group IV (100 to 200 Ha.) (300 to 500 Acres) ^b		Size Group V (200 to 400 Ha.) (500 to 1000 Acres) ^b		Size Group VI (Above 400 Ha.) (Above 1000 Acres) ^b	
					No.	Produ- ction	No.	Produ- ction	No.	Produ- ction	No.	Produ- ction	No.	Produ- ction	No.	Produ- ction
1955 ^c	6,604	320,238	307,704	961	55	71	242	3,550	181	11,477	196	27,176	521	201,285	Included	
1956	6,840	320,588	308,719	963	3,972	2,117	616	4,887	259	16,368	149	33,237	665	248,570	in	
1957	7,123	323,285	310,802	961	4,046	2,546	658	6,664	263	17,348	252	34,146	672	241,061	Size-Group V	
1958	7,276	325,357	325,225	1,000	4,800	2,752	694	6,967	262	17,063	257	36,097	673	260,191		
1959	8,084	326,494	325,955	998	5,608	2,877	739	6,522	266	17,652	249	41,544	471	147,677	205	111,638
1960	8,934	330,738	321,077	971	6,208	2,314 ^d	707	5,619	273	17,215	240	35,234	485	148,952	201	104,894
1961	9,499	331,229	354,397	1,070	6,483	2,103 ^d	556	3,515	220	12,324	317	46,233	476	156,769	216	124,751
1962	9,653	332,524	345,735	1,043	6,614	2,359 ^d	548	4,043	220	12,069	319	43,254	484	153,962	204	115,737
1963	9,774	334,036	346,413	1,037	6,670	3,011 ^d	549	4,386	213	11,359	323	47,030	494	155,614	201	116,809
1964	9,835	337,874	372,485	1,102	7,000	2,522 ^d	555	4,534	203	11,214	310	45,723	478	158,162	234	141,461
1965	10,166	341,762	366,374	1,072	7,649	2,590 ^d	556	4,200	206	11,261	313	42,125	468	151,737	245	145,256
1966	10,823	345,256	375,983	1,089	7,683	2,620 ^d	565	4,412	197	10,974	316	42,210	463	151,857	249	153,365
1967	10,861	347,653	384,759	1,107	7,708	3,033 ^d	584	4,825	191	10,143	317	43,155	459	151,767	257	162,179
1968	10,901	351,065	402,489	1,146	8,310	2,825 ^d	578	4,608	191	10,511	314	42,483	463	154,753	260	170,597
1969	11,501	353,359	393,588	1,114	8,415	2,499 ^d	588	4,238	182	9,988	320	44,611	448	147,204	265	174,301
1970	11,603	354,133	418,516	1,182	8,826	2,963 ^d	590	4,163	179	11,083	313	44,337	454	156,649	268	187,471
1971	12,015	356,516	435,468	1,221	9,797	2,682 ^d	595	4,483	179	10,988	316	46,406	456	161,636	271	195,941
1972	12,999	358,675	455,996	1,271	9,907	2,378 ^d	608	4,271	183	11,597	308	47,090	448	168,624	273	208,216
1973	13,117	360,108	471,952	1,311	9,907	3,200 ^d	608	5,203	183	12,039	308	51,101	448	181,814	273	220,620
1974	13,247	361,663	489,475	1,353	10,026	3,312 ^d	616	5,341	183	13,173	309	54,469	451	179,884	277	235,174
1975	13,264	363,303	487,137	1,341	10,042	3,202 ^d	614	7,006	184	12,716	314	49,981	447	170,467	278	222,751

a - All the figures exclude that of Kangra (Punjab) and Mandi (Himachal Pradesh) where the major production takes place in a large number of very small tea estates, data for which is not available.

b - Applicable for data upto 1960.

c - Size-group data are for North India only as data for South India (Madras, Mysore and Kerala) are not available.

d - Production for South India (not available) was estimated by using acreage under size group I and yearly productivity of size group II in South India, and added to production figures for North India to give these estimates.

Source: Tea Statistics (Annual), Tea Board of India, various issues.

Table C.2 : Sugar Industry in India, 1955-75

Year	Area under Sugar-cane ('000 Hect-ares)	Yield of Cane per Hectare ('000 Tonnes)	Production of Sugar-cane ('000 Tonnes)	Number of Fact-ories in operation	Number of co-oper-ative fact-ories in operation	Average Annual Capa-city (Tonnes per 24 hours)	Total Cane Crushed ('000 Tonnes)	Total Sugar Produ-ced ('000 Tonnes)	Perce-ntage Sugar Extra-ction (9/8)	Produ-ction of Sugar by Co-oper-atives ('000 Tonnes)	Perce-ntage Share of Co-oper-atives in Produ-ction (11/9)
1	2	3	4	5	6	7	8	9	10	11	12
1955-56	1,846	39.3	72,692	143	3	1,012	19,241	1,829	9.50	26	1.42
1956-57	2,051	40.5	83,858	147	8	1,048	21,187	2,059	9.72	58	2.82
1957-58	2,072	40.3	83,651	158	14	1,073	20,055	2,009	10.02	150	7.47
1958-59	1,948	44.2	86,149	164	21	1,098	19,800	1,949	9.84	179	9.18
1959-60	2,137	42.7	91,394	167	25	1,174	24,811	2,460	9.91	292	11.87
1960-61	2,413	45.7	110,544	174	30	1,168	31,109	3,028	9.73	445	14.70
1961-62	2,456	42.3	107,226	179	34	1,166	27,937	2,730	9.77	475	17.40
1962-63	2,242	41.0	91,913	186	41	1,128	20,765	2,135	10.28	573	26.84
1963-64	2,249	46.4	104,225	193	48	1,207	25,632	2,562	10.00	601	23.46
1964-65	2,603	46.7	122,077	198	50	1,204	33,459	3,232	9.66	795	24.60
1965-66	2,836	43.7	123,990	200	53	1,249	36,404	3,532	9.70	941	26.64
1966-67	2,301	40.3	92,827	201	55	1,237	21,659	2,159	9.97	662	30.66
1967-68	2,047	46.6	95,500	201	58	1,304	22,599	2,247	9.94	689	30.66
1968-69	2,532	49.2	124,676	206	63	1,322	37,455	3,558	9.50	1,207	33.92
1969-70	2,748	49.1	135,024	215	70	1,363	45,672	4,261	9.32	1,382	32.43
1970-71	2,615	48.3	126,368	216	73	1,359	38,204	3,740	9.79	1,263	33.77
1971-72	2,390	47.5	113,569	221	79	1,429	30,973	3,108	10.03	1,292	41.57
1972-73	2,452	50.9	124,867	229	N.A.	1,447	40,401	3,872	9.58	N.A.	N.A.
1973-74	2,752	51.2	140,805	229	N.A.	1,470	42,283	3,949	9.34	N.A.	N.A.
1974-75	2,894	49.9	144,289	247	N.A.	1,528	48,435	4,794	9.90	N.A.	N.A.

N.A. = Not Available.

Source : (i) Indian Sugar, March 1978.

(ii) P.S. Rajagopal Naidu, "Explanatory Note" (Annexure D), in Report of Sugar Enquiry Commission, 1974, Ministry of Agriculture, Government of India, New Delhi, 1974 (for columns 6 and 11).

Table C.3 : Cotton Textile Industry, 1955-75 (Mill Sector)

Year	Number of Mills (Spinning + Composite)	Installed Spindlage ('000)	Installed Loomage ('000)	Percentage of Working Spindles (Average of 3 shifts)	Percentage of Working Looms (Average of 3 shifts)	Total Cotton Cloth Production (Million Metres)	Percentage Share of Mill Sector in 7
1	2	3	4	5	6	7	8
1955	408	11,958	203	65.58	62.84	6,278	74.2
1956	412	12,051	203	71.21	66.89	6,515	74.5
1957	436	12,492	201	69.37	79.96	6,673	72.9
1958	470	13,054	201	65.57	63.22	6,473	69.6
1959	482	13,406	201	67.53	63.27	6,579	68.5
1960	479	13,550	200	72.35	65.70	6,629	69.6
1961	479	13,663	199	76.36	68.65	7,073	66.4
1962	481	13,833	199	78.44	68.10	6,972	65.4
1963	498	14,117	200	79.89	60.73	7,299	60.6
1964	514	14,661	203	82.80	70.25	7,720	60.3
1965	543	15,433	206	79.26	69.33	7,643	60.0
1966	575	16,118	209	73.10	67.31	7,336	57.8
1967	609	16,666	207	76.51	68.21	7,276	56.3
1968	635	17,095	207	73.10	66.99	7,896	55.3
1969	647	17,426	208	72.68	66.86	7,706	54.1
1970	656	17,668	208	74.86	67.43	7,849	53.0
1971	664	17,880	208	71.66	65.59	7,356	53.8
1972	670	18,114	208	73.48	69.33	8,022	52.9
1973	688	18,404	207	73.15	73.47	7,771	54.1
1974	689	18,489	206	72.84	73.26	8,284	52.1
1975	691	18,857	207	76.81	76.36	8,034	50.2

Source : Handbook of Statistics on Cotton Textile Industry, The Indian Cotton Mills Federation, Bombay, various issues.

Table C.4 : Performance of Iron and Steel Industry in India

Year	Ingot Steel Production ('000 Tonnes)					Saleable Steel Production ('000 Tonnes)				
	Total	TISCO	HSL	IISCO (Inclu- sive of SCOB)	MISW/ MISL/ VISL	Total	TISCO	HSL	IISCO (Inclu- sive of SCOB)	MISW/ MISL/ VISL
1	2	3	4	5	6	7	8	9	10	11
1955-56	1,654 ^a	1,076	-	540	38	1,309 ^a	812	-	460	37
1956-57	1,662 ^a	1,088	-	541	33	1,303 ^a	812	-	451	40
1957-58	1,678 ^a	1,122	-	516	40	1,254 ^a	799	-	419	36
1958-59	1,822 ^a	1,166	-	610	46	1,441 ^a	899	-	506	36
1959-60	2,597 ^a	1,555	158	840	44	2,009 ^a	1,237	63	672	37
1960-61	3,418	1,622	776	914	44	3,454	1,263	554	722	41
1961-62	4,285	1,643	1,605	934	50	4,001	1,318	1,095	737	41
1962-63	5,395	1,799	2,491	1,002	46	4,918	1,413	1,710	795	41
1963-64	5,945	1,892	2,915	1,027	48	5,537	1,507	2,171	810	43
1964-65	6,138	1,956	3,117	950	48	5,562	1,568	2,326	755	44
1965-66	6,526	1,979	3,447	970	69	5,624	1,568	2,494	723	64
1966-67	6,610	2,001	3,461	897	75	5,949	1,568	2,563	709	69
1967-68	6,347	1,933	3,461	791	92	5,547	1,534	2,426	613	80
1968-69	6,564	1,816	3,760	777	115	5,946	1,465	2,642	640	83
1969-70	6,536	1,708	3,846	700	132	5,999	1,440	2,826	568	102
1970-71	6,302	1,716	3,663	627	107	5,596	1,375	2,684	508	69
1971-72	6,410	1,708	3,532	617	128	5,795	1,387	2,632	500	95
1972-73	6,960	1,690	4,069	431	147	6,148	1,458	3,023	347	102
1973-74	6,430	1,514	3,806	439	145	5,166	1,200	2,830	358	111
1974-75	6,984	1,722	3,964	532	131	5,795	1,461	3,062	415	92

a - Total of the four individual companies only.

Source : (i) Statistics for Iron and Steel Industry in India, HSL, Ranchi, various issues.

(ii) Monthly Statistics of the Production of Selected Industries in India, C.S.O., New Delhi, various issues.

(iii) Annual Report, Ministry of Steel and Mines, Government of India, New Delhi, 1974-75 and 1975-76.

Table C.5 : Production of Aluminium in India, 1955-75

Year	Total Primary Aluminium (Ingot) Production (Tonnes)	Total Production of Rolled Products (Sheets, Circles, etc.) (Tonnes)	INDAL Production of Primary Aluminium (Tonnes)	INDAL Production of Rolled Products (Tonnes)	HINDALCO Production of Primary Aluminium (Tonnes)	HINDALCO Production of Rolled Products (Tonnes)	ALUCORP Production of Primary Aluminium (Tonnes)	ALUCORP Production of Rolled Products (Tonnes)
1	2	3	4	5	6	7	8	9
1955	7,312	10,455	4,934	6,106	-	-	2,379	1,793
1956	6,573	10,991	4,031	6,742	-	-	2,542	2,124
1957	7,851	11,415	5,553	7,400	-	-	2,299	1,815
1958	8,264	14,182	5,756	8,975	-	-	2,509	1,941
1959	17,389	16,465	14,887	10,423	-	-	2,501	2,174
1960	18,120	16,413	15,767	10,871	-	-	2,353	2,093
1961	18,270	16,820	15,797	11,088	-	-	2,473	2,225
1962	35,045	16,010	22,743	9,277	8,333	-	3,969	2,353
1963	54,966	22,440	25,278	14,890	22,138	-	7,550	3,114
1964	56,667	22,277	26,607	14,617	22,880	-	7,180	2,642
1965	68,984	25,699	30,482	16,096	25,243	1,068	7,274	3,240
1966	83,764	31,824	26,230	14,312	40,566	7,963	7,152	4,150
1967	96,575	33,286	34,620	13,879	43,614	8,969	7,609	4,530
1968	120,136	35,319	38,745	17,214	59,708	9,383	8,641	3,010
1969	132,556	36,505	41,561	17,913	72,231	11,162	5,525	1,895
1970	161,081	42,292	61,663	19,092	78,191	15,922	8,073	2,524
1971	178,179	45,576	79,889	20,516	78,002	17,077	7,559	2,818
1972	179,103	56,680	78,580	25,187	78,503	17,670	7,826	3,131
1973	154,335	53,621	76,426	30,025	63,470	17,425	5,169	1,950
1974	128,915	N.A.	67,340	26,100	44,002	N.A.	N.A.	N.A.
1975	167,422	N.A.	78,446	22,321	62,427	N.A.	N.A.	N.A.

INDAL : Indian Aluminium Company.

HINDALCO : Hindustan Aluminium Corporation.

ALUCORP : Aluminium Corporation of India.

Source : (1) Tariff Commission, Report on the Continuance of Protection to the Aluminium Industry, Manager of Publications, Government of India, New Delhi, various issues.

(2) Tariff Commission, Report on the Review of Progress of the Aluminium Industry, Controller of Publications, New Delhi, 1974.

(3) Stock Exchange Directory, Bombay, 1980.

(4) Annual Reports, Directorate General for Trade Development, New Delhi, 1976, 1977.

Table C.6 : Paper and Paper Board Production, 1955-75

Year	Installed Capacity	Total Production	Total Production			
			Orient Paper (4)	Titagar Paper (5)	Ballarpur (6)	Shree Gopal (7)
(1)	(2)	(3)				
1955	189.2	187.8	32.4	44.9	8.8	14.0
1956	215.3	196.5	35.4	49.2	9.3	13.5
1957	256.0	213.5	40.8	52.4	9.7	15.0
1958	273.1	257.0	N.A.	N.A.	10.3	17.5
1959	326.1	298.7	N.A.	N.A.	11.2	19.0
1960	400.0	345.3	N.A.	N.A.	12.3	21.0
1961	410.0	363.9	N.A.	N.A.	12.8	29.0
1962	433.8	387.6	N.A.	N.A.	13.3	35.0
1963	502.2	462.6	N.A.	N.A.	16.6	38.0
1964	555.9	490.7	62.3	53.4	25.3	36.0
1965	643.9	537.0	87.0	59.8	37.7	35.4
1966	643.9	585.1	113.0	63.2	45.2	35.9
1967	701.2	608.8	126.5	64.3	45.8	36.0
1968	730.0	646.6	126.8	68.0	47.0	39.0
1969	733.2	706.5	N.A.	38.5	70.3	Amalga-
1970	768.0	758.5	N.A.	56.6	94.5	ated
1971	900.6	780.8	N.A.	71.2	97.05	with
1972	902.0	884.1	N.A.	75.6	101.25	Ballarpur
1973	902.0	775.1	N.A.	79.6	105.9	Industries
1974	902.0	816.7	131.7	80.6	108.9	Ltd.
1975	1068.0	813.4	122.0	78.8	110.1	

- Source:** a) Statistical Abstract for the Indian Union, Central Statistical Organisation, New Delhi, various issues (for columns 2 and 3).
 b) Tariff Commission, Report on the Fair Ex-Works and Fair Selling Prices of Paper and Paper Boards, Manager of Publications, New Delhi, 1959.
 c) Paper Industry: Problems and Prospects, National Council of Applied Economic Research, New Delhi, 1972.
 d) Stock Exchange Directory, Stock Exchange, Bombay, 1980.
 e) Data supplied by the individual companies (adjusted to correspond to the calendar year instead of their own financial year).

Table C.7 : Cement Production in India, 1955-75

Year	('000 Tonnes)											
	Total Production	Installed Capacity	Total Production A.C.C.	Total Production Jaipur Udyog	Total Production Shree Digvijay (3 units)	Total Production Rohtas	Total Production Ashoka	Total Production Sone Valley	Total Production India Cements (2 units)	Total Production U.P.State (2 units)	Total Production Birla Jute (3 units)	Total Production Dalmia (Bharat)
1	2	3	4	5	6	7	8	9	10	11	12	13
1955	4,559 (27)	4,819	2,469	200	230	331	-	198	137	175	-	270
1956	5,008 (27)	5,795	2,839	183	251	326	1.3	178	124	204	-	267
1957	5,692 (28)	6,638	2,965	310	362	262	93	181	216	226	-	283
1958	6,166 (30)	7,172	3,008	466	356	314	120	205	241	224	-	237
1959	6,936 (33)	8,456	3,378	594	397	273	163	182	336	215	117	273
1960	7,844 (33)	8,711	3,492	672	449	308	174	212	468	232	170	389
1961	8,245 (35)	9,474	3,599	726	404	N.A.	N.A.	N.A.	N.A.	N.A.	244	406
1962	8,586 (35)	9,728	3,698	803	472	N.A.	N.A.	N.A.	N.A.	N.A.	228	495
1963	9,355 (37)	10,285	3,810	827	503	N.A.	N.A.	N.A.	N.A.	N.A.	236	461
1964	9,690 (38)	10,768	3,920	735	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1965	10,578 (39)	11,694	4,130	717	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1966	11,058 (41)	12,497	4,378	774	618	282	177	240	800	390	495	531
1967	11,309 (42)	12,781	4,508	830	560	327	160	233	813	349	711	513
1968	11,944 (45)	14,760	4,722	801	540	344	141	193	977	345	708	501
1969	13,624 (46)	15,560	5,103	887	676	310	162	195	998	391	837	524
1970	13,956 (50)	16,956	5,227	780	738	315	164	144	1,088	354	828	504
1971	14,931 (51)	18,491	5,372	710	776	326	190	33	1,277	420	805	512
1972	15,785 (52)	19,776	5,398	688	749	285	213	103	1,368	664	1,029	496
1973	15,006 (52)	19,776	5,441	676	715	265	183	269	1,043	654	936	437
1974	14,316 (52)	19,865	5,274	473	706	179	107	254	1,034	477	1,022	427
1975	16,236 (55)	21,210	5,866	293	773	138	112	256	1,179	647	1,151	492

Note : Numbers within parentheses in column 2 refer to number of units.

Source: (a) The Cement Industry in India, 1914-1964, Cement Manufacturers' Association, Bombay, 1964.

(b) Tariff Commission, Report on the Revision of Fair Prices Payable to Cement Producers, Manager of Publications, New Delhi, 1958, 1961.

(c) Cement Manufacturers' Association, Bombay.

(d) The production figures of A.C.C. and Jaipur Udyog for the years 1961-65 are estimated from production figures for their respective financial years, supplied by these two companies.

Table C.8 : National Aggregates and Ratios, 1955-56 to 1974-75

	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65
1. National Income (Rs. Crores)	9,980	11,310	11,390	12,600	12,950	13,263	13,987	14,795	16,977	20,001
2. Total Consumption ^a (Rs. Crores)	8,990	10,220	10,560	11,800	11,880	11,968	12,518	13,183	14,731	17,529
3. Total Investment ^b (Rs. Crores)	1,469	1,959	1,843	1,785	1,996	2,544	2,438	2,916	3,266	3,735
4. Per Capita Income (Rs.)	255.0	283.3	279.6	303.0	304.8	305.6	315.0	325.9	365.9	422.0
5. Public Expenditures ^c (Rs. Crores)	1,077	1,185	1,347	1,447	1,570	1,708	1,950	2,313	2,860	3,109
6. Total Tax Revenue (Rs. Crores)	768	889	1,047	1,091	1,220	1,355	1,538	1,855	2,313	2,585
7. Corporation Income Tax (Rs. Crores)	37	51	56	54	107	111	156	222	275	314
8. J_t [(6-7)/1]	0.0732	0.0741	0.0870	0.0823	0.0859	0.0938	0.0988	0.1104	0.1200	0.1135
9. G_t (2/1)	0.9008	0.9036	0.9271	0.9365	0.9174	0.9024	0.8950	0.8910	0.8677	0.8764
10. G_t (5/1)	0.1079	0.1048	0.1183	0.1148	0.1212	0.1288	0.1394	0.1563	0.1685	0.1554
11. I_t (3/1)	0.1472	0.1732	0.1618	0.1417	0.1541	0.1918	0.1743	0.1971	0.1924	0.1867

(continued)

Table C.8 : (continued)

	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
1. National Income (Rs. Crores)	20,637	23,848	28,054	28,607	31,606	34,412	36,728	40,391	50,498	59,417
2. Total Consumption ^a (Rs. Crores)	18,528	21,767	26,255	26,242	28,509	30,145	32,546	35,566	44,848	53,348
3. Total Investment ^b (Rs. Crores)	4,390	5,437	5,334	5,113	6,285	7,253	7,962	8,413	10,762	13,300
4. Per Capita Income (Rs.)	425.5	482.5	555.4	554.6	600.6	636.1	663.0	713.6	873.7	1007.1
5. Public Expenditures ^c (Rs. Crores)	3,476	3,876	4,120	4,538	5,109	5,691	6,708	7,429	8,217	10,416
6. Total Tax Revenue (Rs. Crores)	2,902	3,240	3,423	3,727	4,182	4,735	5,566	6,433	7,363	9,207
7. Corporation Income Tax (Rs. Crores)	305	329	310	300	353	371	472	558	583	710
8. $J_t [(6-7)/1]$	0.1258	0.1221	0.1110	0.1198	0.1211	0.1268	0.1387	0.1455	0.1343	0.1430
9. $C_t (2/1)$	0.8978	0.9127	0.9359	0.9173	0.9020	0.8760	0.8861	0.8805	0.8881	0.8979
10. $G_t (5/1)$	0.1684	0.1625	0.1469	0.1586	0.1616	0.1654	0.1826	0.1839	0.1627	0.1753
11. $I_t (3/1)$	0.2127	0.2280	0.1901	0.1787	0.1989	0.2108	0.2168	0.2083	0.2131	0.2238

Notes: a) The consumption (Total Private Consumption Expenditures) figures for 1954-55 to 1959-60 were calculated as Net Domestic Product at Market Prices minus government current expenditures (Administrative departments) minus total net domestic capital formation [Appendix A.2.3 of Source (3)], plus import surplus. Figures for other years are given. The calculations are as suggested by S.P. Dhar and S.K. Aggarwal, "Private Consumer Expenditure in India: 1955-56 to 1960-61," Paper submitted to Fourth Indian Conference on Research in National Income, Bhopal, 1963.

b) Total Investments are the same as total gross domestic capital formation Table A.2.3 and Table 11 of Source (3) and Account 5 of Source (2).

c) Public Expenditure figures upto 1959-60 have been calculated as total public expenditure of administrative departments on current account (Table 6) plus that on capital account (Table 8) from Source (1). Rest of the figures are directly taken from Table 26 and Table 22 of Source (2) and (3).

Source: (1) C.S.O., Estimates of National Income: 1948-49 to 1961-62, January 1963, New Delhi.

(2) C.S.O., National Accounts Statistics: 1960-61 to 1974-75, October 1976, New Delhi.

(3) C.S.O., National Accounts Statistics: 1970-71 to 1975-76, January 1978, New Delhi.

Table D : Non-Financial Variables Used in the Regressions

Industry/Variables	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65
1. Tea Plantations										
(1) Per Acre Yield ^a	0.962	0.962	0.9805	0.999	0.9845	1.0205	1.0565	1.040	1.0695	1.087
2. Sugar										
(i) Sugar Extraction ^b	0.0961	0.0967	0.0995	0.0989	0.0989	0.0978	0.0976	0.1015	0.1007	0.0975
(ii) Capacity Utilization ^c	0.3562	0.3737	0.3373	0.3069	0.3353	0.4012	0.3799	0.2951	0.2939	0.3638
3. Cotton Textiles										
(1) Capacity Utilization ^d	0.6663	0.7186	0.6954	0.6490	0.6722	0.7077	0.7289	0.7179	0.7342	0.7542
4. Iron and Steel										
(1) Capacity Utilization ^e	1.1156	1.1191	0.9700	0.9701	1.2948	1.1856	1.0102	1.2165	1.3131	1.3616
(ii) Share of Public Sector ^f	0.0230	0.0199	0.0238	0.0252	0.0778	0.2399	0.3862	0.4703	0.4984	0.5156
5. Aluminium										
(1) Capacity Utilization ^g	0.9151	0.9524	1.0644	1.0384	0.9990	0.9217	0.7457	0.8471	1.0284	0.9313
(ii) Share of Top Two Companies ^h	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9434	0.8747	0.8680	0.8406
6. Paper										
(1) Capacity Utilization ⁱ	0.9529	0.8734	0.8875	0.9286	0.8897	0.8755	0.8906	0.9074	0.9019	0.8583
7. Cement										
(1) Capacity Utilization ^j	0.8825	0.8610	0.8485	0.8160	0.8415	0.8680	0.8770	0.9050	0.9150	0.9070

Notes: (a) Tonnes per hectare (total), as reported in Appendix Table C.1.

(b) Total Sugar production divided by total cane crushed, given in Appendix Table C.2.

(c) It makes no allowance for the idle season of the factories. Calculated as average daily quantum of cane crushed divided by average daily crushing capacity, as reported in Appendix Table C.2.

(d) Mean working spindles and looms (average of three shifts), as reported in Appendix Table C.3.

(e) Refers to ingots only. From 1970-71 onwards, the data relate to HSL, TISCO and IISCO only. Figures taken or calculated from (i) Statistical Abstract for the Indian Union, various issues, C.S.O., New Delhi, and (ii) Department of Steel, White Paper on Steel Industry, Ministry of Steel and Mines, Government of India, 1976.

(continued)

Table D : (continued)

Industry/Variables	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
1. Tea Plantations										
(i) Per Acre Yield ^a	1.085	1.1025	1.136	1.122	1.165	1.211	1.2585	1.301	1.3425	1.344
2. Sugar										
(i) Sugar Extraction ^b	0.0968	0.0984	0.0996	0.0972	0.0941	0.0956	0.0991	0.0981	0.0946	0.0962
(ii) Capacity Utilization ^c	0.3918	0.3190	0.2375	0.3065	0.4019	0.3918	0.3127	0.3014	0.3391	0.3479
3. Cotton Textiles										
(i) Capacity Utilization ^d	0.7123	0.7182	0.7063	0.6984	0.7081	0.6926	0.7072	0.7284	0.7312	0.7571
4. Iron and Steel										
(i) Capacity Utilization ^e	1.4351	1.4087	1.4071	1.4142	1.3769	0.6691	0.6518	0.6887	0.6409	0.6899
(ii) Share of Public Sector ^f	0.5388	0.5501	0.5598	0.5903	0.6086	0.5982	0.5710	0.6057	0.6145	0.5863
5. Aluminium										
(i) Capacity Utilization ^g	0.8780	0.9949	1.0231	1.1001	1.0997	1.0697	1.0217	0.8411	0.6568	0.6878
(ii) Share of Top Two Companies ^h	0.8000	0.8069	0.8172	0.8464	0.8658	0.8816	0.8794	0.8991	0.8744	0.8470
6. Paper										
(i) Capacity Utilization ⁱ	0.8900	0.8783	0.8813	0.9441	0.9817	0.8972	0.9518	0.8895	0.8939	0.7976
7. Cement										
(i) Capacity Utilization ^j	0.8915	0.8880	0.8290	0.8570	0.8213	0.7710	0.7975	0.7860	0.7345	0.7575

Notes: (f) Refers to ingots only, data for which is reported in Appendix Table C.4.

(g) Based on data from Statistical Abstract, various issues.

(h) Based on data from Appendix Table C.5 (refers to primary metal only).

(i) Based on data from Statistical Abstract, various issues.

(j) All the figures are adjusted, wherever necessary, to correspond with the period (12-month) for which the sample companies data are reported.

Source : See Notes above.

Table E : Growth of Corporate Sector in India, 1950-75

Year	(Paid-up Capital in Rs. Crores)												Total	
	Government Companies						Non-Government Companies							
	Number			Paid-up Capital			Number			Paid-up Capital			Number	Paid-up Capital
	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private		
1950-51	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	28,532	775.4
1951-52	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	29,223	855.8
1952-53	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	29,312	897.6
1953-54	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	29,492	941.2
1954-55	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	29,625	969.9
1955-56	61	N.A.	N.A.	66.0	N.A.	N.A.	29,813	N.A.	N.A.	958.2	N.A.	N.A.	29,874	1024.2
1956-57	74	39	35	72.6	18.9	53.7	29,283	8,771	20,512	1005.0	695.7	309.3	29,357	1077.6
1957-58	91	41	50	256.8	18.0	238.8	28,189	8,255	19,934	1049.5	755.6	293.9	28,280	1306.3
1958-59	104	38	66	428.9	22.8	406.1	27,299	7,608	19,691	1086.7	782.2	304.5	27,403	1515.6
1959-60	125	37	88	477.2	26.4	450.8	26,772	7,151	19,621	1141.5	814.1	327.4	26,897	1618.7
1960-61	142	39	103	547.0	33.0	514.0	26,007	6,663	19,344	1271.5	915.2	356.3	26,149	1818.5
1961-62	154	41	113	629.7	23.5	606.2	24,821	6,399	18,422	1389.4	1093.3	296.1	24,975	2019.1
1962-63	160	42	118	786.0	27.4	758.6	25,462	6,404	19,058	1470.3	1170.6	299.7	25,622	2256.4
1963-64	176	50	126	960.8	39.4	921.4	25,756	6,474	19,282	1639.9	1278.6	361.3	25,932	2600.7
1964-65	183	54	129	1114.3	51.5	1062.8	26,038	6,450	19,588	1736.9	1353.1	383.8	26,221	2851.2
1965-66	212	63	149	1237.9	58.4	1179.5	26,466	6,329	20,137	1807.0	1407.3	399.7	26,678	3044.9
1966-67	232	65	167	1391.5	77.1	1314.4	26,795	6,478	20,317	2009.8	1592.4	417.4	27,027	3401.3
1967-68	241	72	169	1559.3	99.1	1460.2	27,103	6,497	20,606	2114.5	1684.3	430.2	27,344	3673.8
1968-69	259	81	178	1714.9	121.9	1593.0	27,714	6,454	21,260	2145.4	1712.0	433.4	27,973	3860.3
1969-70	282	81	201	1790.6	130.2	1660.4	28,678	6,436	22,242	2187.7	1740.6	447.1	28,960	3978.3
1970-71	314	91	223	2064.5	133.2	1931.3	30,098	6,443	23,655	2236.9	1775.1	461.8	30,412	4301.4
1971-72	352	107	245	2369.1	156.0	2213.1	32,211	6,571	25,640	2283.7	1800.1	483.6	32,563	4652.8
1972-73	390	126	264	2998.4	219.0	2779.4	34,483	6,715	27,768	2346.7	1840.0	506.7	34,873	5345.1
1973-74	450	147	303	4645.1	249.1	4396.0	37,885	7,027	30,858	2430.0	1882.2	547.8	38,335	7075.1
1974-75	573	210	363	4966.0	315.4	4650.6	41,235	7,436	33,799	2630.1	2015.1	615.0	41,808	7596.1

Source : (i) Quarterly Bluebook on Joint Stock Companies in India, Department of Company Affairs, New Delhi, various issues.

(ii) Report on Currency and Finance, Reserve Bank of India, Bombay, various issues.

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