4. METHODOLOGY AND DATA

In this chapter, we first outline the methodology adopted in our subsequent empirical estimation of inflation-adjusted profits and tax, enumerating the assumptions made in the process. We then discuss the data that have been used for the empirical estimation. Finally, the method of choosing the sample of companies is described.

1. Methodology

Some methodological issues have already been discussed in the preceding chapter in general terms. What is discussed here is their application to this study.

First, our exercises are based alternatively on CCA and CPP, yielding two sets of estimates. Since the debate on the issue of CCA vs. CPP is still raging, it was thought proper not to ignore either of the two methods.

Second, among the three major adjustments inflation accounting requires, we estimate two: depreciation adjustment and cost of sales adjustment. The third, related to net financial liabilities/assets, is not undertaken. This is because of the fact that the method of carrying out this adjustment and the timing of it are still being debated and, more importantly, the required information is not available.[1]

To adjust the depreciation charged, information on the age distribution of physical assets is required. Since this information was not available, an assumption had to be made of necessity. We assume that in the year 1979 (for which we do the calculations) none of the physical assets were more than nine years old. In other words, all the physical assets in the books in 1979 are assumed to have been purchased after 1970. But even this assumption does not suffice because all the information we have is on historical costs of gross fixed assets and

---

[1]See Annexure I for more details on the method of adjusting net financial liabilities.

accumulated depreciation on them for a few broad categories of fixed assets. Taking the change in fixed assets ($\triangle$GFA) as equivalent to acquisitions of new fixed assets will underestimate the total GFA in 1979 as can be seen below:

$$GFA_{1979} = GFA_{1970} + \sum_{t=1971}^{1979} \triangle\,GFA_t \qquad \ldots (4.1)$$

or
$$\sum_{t=1971}^{1979} \triangle\,GFA_t = GFA_{1979} - GFA_{1970} \qquad \ldots (4.2)$$

In other words, according to our assumption, all the fixed assets in the year 1970 are disposed of by the end of 1979, and $\triangle\,GFA_t$ gives us only net acquisitions, *i.e.*, acquisitions minus value of fixed assets disposed of in a particular year. Thus, to estimate the acquisitions of fixed assets from the year 1970 onwards, we have to make another assumption about the writing off of fixed assets in the books in 1970. We assume that equal values of these are disposed of every year, so that from 1971 to 1979, the value of assets being disposed of is equal to $GFA_{1970}/9$. By adding this amount to the net acquisitions every year, we estimate gross acquisitions (PUR_t) for each year starting with 1971 as $\triangle\,GFA_t + (GFA_{1970}/9)$. This also ensures that the earlier assumption of gross acquisitions for the years 1971 to 1979 total GFA_{1979} holds true.

Armed with these estimates of age-distribution of the assets in the books in 1979, we proceed to calculate the inflation-adjusted values of depreciation on these assets in 1979. Since the income tax rules allow the use of written-down value method as the basis of depreciation, we adopt the same method. This method consists of charging a constant rate of depreciation on the written-down value of the asset (also known as net fixed asset). Denoting annual depreciation charge by DEP_t and accumulated depreciation on a particular type of asset as AD_t'

$$DEP_t = (GFA_t - AD_t)R, \qquad \ldots (4.3)$$

where R is the rate of depreciation. This rate is actually a constant for a particular asset, though for different assets, different rates have been prescribed. Since we are working with

groups of assets, the composition of these groups would affect the rate of depreciation each year. Moreover, the rates are also subject to change depending on the intensity of use of the asset. Since it was impossible to take into account all these details, we decided to use the 'effective rate of depreciation', defined as DEP_t/NFA_t. Hereafter, R would denote this effective rate of depreciation.

Now, leaving aside the question of the appropriate price index and assuming that we know which one is to be used, the adjusted depreciation charges can be estimated in the following manner.

Since in 1979 only assets bought after 1970 are in the books, we observe the progressive position of depreciation allowed on these assets through the nine years under inflation accounting.

$$DEP^a_{1971} = PUR_{1971} \, R_{1971}$$

$$DEP^a_{1972} = [(PUR_{1971} - DEP^a_{1971}) \, P_{1972}/P_{1971} + PUR_{1972}] \, R_{1972}$$

$$DEP^a_{1973} = [(PUR_{1971} - DEP^a_{1971}) \, P_{1973}/P_{1971} +$$
$$(PUR_{1972} - DEP^a_{1972}) \, P_{1973}/P_{1972} +$$
$$PUR_{1973}] \, R_{1973}.$$

In the same manner, finally in 1979,

$$DEP^a_{1979} = \left[\sum_{t=1971}^{1978} \left\{ (PUR_t - DEP^a_t) \, P_{1979}/P_t \right\} + PUR_{1979} \right] R_{1979} \qquad \ldots (4.4)$$

This is the formula we use to estimate the adjusted depreciation charge for the year 1979 for different groups of assets. P_t represents the chosen price index and the superscribed 'a' denotes 'adjusted for inflation', However, the assumptions involved hardly hold for roads, buildings and other construction work. Normally, these would be fixed assets with quite long lives, necessitating a different set of assumptions. We calculate adjusted depreciation for these fixed assets in a different way.

First, we assume that these assets were, on average, n years old. The value of n can be specified by taking into account the average age of the sample companies because, in most cases, these assets will have continued upto 1979 from the inception of the companies. Second, we assume that net investments in

this category of fixed assets are not very different from gross investments, or in other words, $\triangle \text{GFA}_t \simeq \text{PUR}_t$.

To ascertain what value n should take, we note below the frequency distribution of the sample companies by age in 1979.

Table 4.1

Age Distribution of Sample Companies

Age Group	Number of companies
Upto 10 years	20
Between 11 and 20 years	24
Between 21 and 40 years	26
Between 41 and 60 years	16
More than 60 years	4
TOTAL	90

It can be seen that 70 out of 90 companies are not more than 40 years old. Of these, most are between 21 years and 40 years old. Armed with this information, we decided that the value of n should be 25.[2]

This would imply that, in 1970, the abovementioned fixed assets were 15 years old on an average and hence were acquired in 1955. Then, in 1970, the adjusted NFA would be

$$\text{NFA}^a_{1970} = (\text{GFA}_{1970} - \text{AD}_{1970}) \, \text{P}_{1970}/\text{P}_{1955} \qquad \ldots (4.5)$$

Adjusted depreciation is simply,

$$\text{DEP}^a_{1970} = \text{NFA}^a_{1970} . \, \text{R}_{1970} \qquad \ldots (4.6)$$

For the subsequent years, adjusted depreciation can then be estimated as:

$$\text{DEP}^a_t = \left[\text{NFA}^a_{1970} . \, \frac{\text{P}_t}{\text{P}_{1970}} + \sum_{i=1972}^{t-1} (\text{GFA}_i - \text{DEP}^a_i) \right.$$

$$\left. \frac{\text{P}_t}{\text{P}_i} + \triangle \text{GFA}_t \right] \text{R}_t \qquad \ldots (4.7)$$

This formula can yield the estimates of adjusted deprecia-

---

[2]This decision is also based on the actual age of individual companies falling in the second and third groups.

tion for particular types of long-lived assets for the year 1979. Adding together adjusted depreciation figures for all types of assets, we have the total inflation-adjusted depreciation estimate for the year 1979.

The cost of sales adjustment to eliminate illusory inventory profits is the one suggested by the *Hyde Guidelines* which has been explained in Section 4 of the preceding chapter. Without repeating the method we give below only the formula:

$$\text{COSA}_t = (C_t - O_t) - \left(C \frac{\bar{P_t}}{P_{c,\,t}} - O \frac{\bar{P_t}}{P_{o,\,t}} \right) \quad \ldots (4.8)$$

where COSA refers to cost of sales adjustment, C and O are closing and opening inventories, respectively, P_t is average price index for the year t, and P_c and P_o are price indices at the close and beginning of the year, respectively. This estimation can be done for two groups of inventory which we consider separately. Adding the adjustments together, we get the total of the cost of sales adjustment.

Once the magnitudes of these adjustments are calculated, profits before tax are adjusted accordingly. Taking the same amount of tax provision as given in the books (based on the historical cost figures), we recompute the effective tax rate.

The difference between the actual and adjusted effective tax rates measures the over/undertaxation under the corporate income tax. From the adjusted profits before tax, tax provision and dividends (the same amounts as shown in the original accounts) are deducted to arrive at the figure for retained profits, after allowance for inflation is made. We then examine this figure to draw conclusions about self-generation of capital funds in the corporate sector in India.

The sample estimates are blown up for the populations as a whole for each age-group separately, because that was the characteristic on the basis of which the sample was selected separately for each group, using the PPS (probability proportional to size) method. For other groupings (based on industry affiliation or size), the blowing up is not undertaken as that would have been statistically incorrect. The size groups and industry groups have been constructed from among the sample companies which were selected on the basis of age. Hence, except groupings based on age, other groupings do not consti-

tute representative samples.

2. Nature and Availability of Data

The primary source of data for this analysis has been the annual reports of the individual sample companies, which contain the accounts for the current year and the previous year. Wherever necessary, the Directors' Report was also used. This source provided all the financial data for the sample companies.[3]

The price data were collected mainly from Chandhok (1974). which brings together the official data at one place. For the later years, figures from official publications were used.

Since figures under the different items in the various accounts are not always calculated and presented with the same underlying definition in the various annual reports, care was taken to recalculate them to conform to a single definition of each item, as far as possible.

The industry affiliation of each company was decided on the basis of its major sales item. When no particular industry affiliation could be decided upon, the company was put in the 'miscellaneous' category.

The major raw materials consumed were decided upon from the information given in the annual reports about funds spent on each item of raw materials.

3. The Sample

The sampling was done with the help of the *Factsheets* (1980) which gives some details of all large and medium non-government public limited companies. The population was further narrowed down to only non-financial and non-service companies. For the government companies, the population consisted of the non-financial, non-service companies owned by the Central government. The information on these companies was obtained from the *Report of the Bureau of Public Enterprises* (1981). The total sample size was 90, with 72 private companies and 18 government companies. The 72 private companies were selected in three groups of unequal size, after the

---

[3]Despite our best efforts, some gaps remained in the data which had to be estimated by us. But such gaps were only few.

population was separated out into three groups on the basis of their date of registration as a public limited company—those registered before 1960, those registered in or after 1960 but before 1970, and those registered in or after 1970. The sample for government companies, however, was selected as a whole without any classification.

The sampling was done using the PPS (probability proportional to size) method, where size was determined on the basis of paid-up capital. This ensured maximum coverage in terms of paid-up capital without damaging the advantages of random sampling, given the size of the sample. The sample coverage for government companies is approximately 26 per cent. Those for the three age-groups of privately-owned non-financial public limited companies are: about five per cent for companies registered before 1960, about eight per cent for companies registered between 1960 and 1970, and about five per cent again for the relatively new ones, registered after 1970.