CHAPTER FIVE

DATABASE

5.1 Objective

The major aim of the study is to analyse the performance of various industry groups in the Indian manufacturing sector at macro level in terms of certain financial parameters which are normally used by the financial analysts for firm level analysis. We would perform such analysis with a view to segregate the various industries at all India level into good and bad performing groups. We would then empirically analyse firm level data at micro level from the industrial sectors which are pre-classified as good performer and bad performer at the macro level. Finally, we would make an attempt to find out which core ratios at the disaggregate level have predictive power to indicate sickness at the firm level.

5.2 Data Requirement

In order to meet this objective in the context of an empirical study on industrial sickness in India, we need two sets of data. The first set of data refers to macro or industry level data. On the basis of this data set, we would first try to locate the industry group(s) at which the incidence of industrial sickness is very high. In other words, we will reclassify the industries into two groups, namely, the good performers and the bad performers. Such an exercise shall have to be performed on the basis of some performance indicators that can be applied on the macro data. Such indicators are usually worked out by economists and the indicators are usually known as economic indicators.

Our objective, however, is not limited to these exercises only. We plan to perform a matching study at the micro or company level data so that a predictive model can be developed. In order to perform such an exercise, we need the company level data as published in the balance sheets and profit and loss accounts of the companies.

38 A model that can predict the probability of a given company to become sick, as hidden in its balance sheet data.
Chapter Five

The empirical work that we propose to perform thus needs two sets of data— a set at the industry level and the other set at the company level.

For the industry level data, we could refer to the published data of the Government of India under the Annual Survey of Industries (ASI)\textsuperscript{39} and the company level data would be collected from the PROWESS\textsuperscript{40} database.

Indicators of sickness that can be developed from the micro level data are derived on the basis of financial ratios. The macro level indicators of sickness are, however, captured in terms of a few broad economic indicators. In order to develop parity between the analyses based on macro and micro level data, we need to develop a correspondence between micro concept of sickness and macro concept of sickness. Otherwise, an analysis based on macro data cannot be linked properly with the micro level analysis.

In this chapter, we take up this exercise. In the next two subsections, we discuss in details the sources of macro level data as given in the ASI. The problems due to changes in National Industrial Classification have also been discussed in this section. The sources of micro level data had been the company level balance sheet and profit and loss account, as compiled by the CMIE. The features of such data and the way we develop a set of panel data out of the PROWESS database has also been discussed in this section. The problem of developing the parity between the financial ratios and the macro economic indicators of sickness is a major problem in developing an empirical exercise based on these two data sets. In the remaining sections of this chapter, we discuss these issues and suggest a method for developing this parity.

In order to prepare a panel data on the basis of which the issue of sickness would be discussed empirically, we need a time series for a period of time that could capture the

\textsuperscript{39} Central Statistical Organisation (CSO) brings out in every financial year the summary results of the economic performance of Indian industries for the entire factory sector and publishes such results in the ASI.

\textsuperscript{40} PROWESS database has been developed by the Centre for Monitoring Indian Economy (CMIE) which collects the company level data and organises them in a user-friendly way so that these data could be utilised for empirical studies based on financial indicators.
changing scenario with respect to the Indian industries. The time frame that we selected had been 1981 to 1998 for the industry level data and 1995 to 2004 for the company level data.

We have thus two main sources of data, namely, Annual Survey of Industries (ASI) data for macro level empirical analyses and CMIE’s corporate database — PROWESS for analyses at micro level. We should add that for overviewing the magnitude of industrial sickness in India, the database of the Board for Industrial and Financial Reconstruction (BIFR) and the Reserve Bank of India (RBI) have also been used.

5.3 ASI Database: An Overview

The main source of data for macro level analyses is the Central Statistical Organisation (CSO) that brings out in every financial year the summary results of the economic performance of Indian industries for the entire factory sector. Results published by the CSO in the Annual Survey of Industries (ASI) have a wide coverage; they are also supposed to be statistically robust. For our study, macro level data have been collected from the Central Statistical Organisation (CSO), Industrial Statistics Wing, 1, Council House Street, Kolkata – 700 001, who had supplied the ASI data from 1981 to 1998 by means of a CD ROM. These data are in the same format as given in the printed volumes. However, all India data are given in NIC 87 (two digit and three digit level), while state level data are given in NIC 8741 (two digit level). Industry specific information collected in this way follows NIC 87 classification code. Data aggregated at two digit and three digit level were available for the national level information.

41 We did not insist on getting data below two digit level for the states because our plan of work did not suggest the data requirement below two digit NIC (National Industrial Classification).
5.3.1 Coverage

The ASI has been conducted since 1959 under the authority of the Collection of Statistics Act, 1953. Of the four broad categories constituting the industrial sector, the ASI is concerned with the collection of data for the organised segments of the manufacturing and electricity, gas and water supply only. Thus, the ASI does not cover mining and quarrying and construction.

In the ASI, all factories registered under sections 2m (i) and 2m (ii) of the Factories Act, 1948, i.e., factories employing ten or more workers with the use of power and factories

---

42 While calculating GDP, industry sector is divided into mining and quarrying; manufacturing; electricity, gas and water supply and construction.

43 A 'Factory' which is the primary statistical unit of enumeration for the ASI is defined as:-

"Any premises including the precincts thereof:-

(i) wherein ten or more workers are working or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on with the aid of power or is ordinarily so carried on,

or

(ii) wherein twenty or more workers are working or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on without the aid of power or is ordinarily so carried on, but does not include a mine subject to the operation of the Mines Act, 1952, or a mobile unit belonging to the armed forces of the Union, or a railway running shed, or a hotel, restaurant or eating place."

The 'manufacturing process' referred to above has been defined in section 2(k) in the Factories Act, 1948 as:-

"Any process for-

(i) making, altering, ornamenting, finishing, packing, oiling, washing, cleaning, breaking up, demolishing or otherwise treating or adapting any article or substance with a view to its use, sale, transport, delivery or disposal; or

(ii) pumping oil, water or sewage or any other substance; or

(iii) generating, transforming or transmitting power; or

(iv) composing types for printing, printing by letter press, lithography, photogravure or other similar process or book binding; or

(v) constructing, reconstructing, repairing, refitting, finishing or breaking up ships or vessels; or

(vi) preserving or storing any article in cold storage."

The 'worker' referred above has been defined in section 2(l) of the Factories Act, 1948 as follows:-

"Worker means a person [employed, directly or by or through any agency (including a contractor) with or without the knowledge of the principal employer, whether for remuneration or not], in any manufacturing process, or in cleaning any part of the machinery or premises used for a manufacturing process, or in any other kind of work incidental to, or connected with, the manufacturing process, or the subject of manufacturing process [but does not include any member of the armed forces of the Union].
employing twenty or more workers without the use of power on any day of the preceding
 twelve months are covered. Besides, bidi and cigar manufacturing establishments
 registered under the Bidi and Cigar Workers (Conditions of Employment) Act, 1966 (i.e.,
 those employing ten or more workers with use of power and twenty or more workers
 without use of power) and all the electricity undertakings registered with the Central
 Electricity Authority irrespective of their size of employment are covered under the ASI.

The ASI also covers certain services and activities, such as, cold storage, water supply
 and repair of motor vehicles and of other consumer durables, like watches since these
 activities involved are incidental to manufacturing process as defined in section 2(k) of
 the Factories Act, 1948. Establishments under the control of the Defence Ministry, oil
 storage and distribution units, restaurants and cafes and also technical training institutes
 not producing anything for sale or exchange are excluded from the purview of the ASI.

The Collection of Statistics Act, 1953, being not applicable to Jammu & Kashmir,
 factories in that state were covered under the ASI on a voluntary basis till a similar State
 Act, called the Jammu & Kashmir Collection of Statistics Act, 1961 was enacted and the
 Collection of Statistics Rules, 1964 was framed thereunder making the collection of
 statistics under the ASI also statutory in that state.

The geographical coverage of the ASI has been extended to the entire country except the
 states of Arunachal Pradesh, Mizoram and Sikkim and Union Territory of Lakshadweep.

5.3.2 Unorganised Sector Not Covered in the ASI

The ASI data does not cover data relating to the unorganised sectors, though firms or
 units under such unorganised sector have a large share of manufacturing industries in
 India. This unorganised sector of the manufacturing industry has been featuring in every
 major industrial policy statement since independence because of its labour intensive and
decentralised character. However, systematic data covering this entire sector on a
 uniform basis with regard to gross output, value added, employment and input-output
 ratios are hard to find. The organisations that predominate this unorganised sector are
family enterprises carrying on productive activity in the household helped mainly by family members and unregistered workshops, generally proprietorships or partnerships, where productive activity is carried on mainly with the help of hired labours. Besides, a small percentage of corporate establishments and cooperatives, which are not registered under the Factories Act, 1948 are also not covered in the ASI data.

As such, the ASI data on the basis of which our study has been carried out does not include the non-factory sector: units not registered under the Factories Act, 1948. They are further subdivided as:

(a) Establishments with 6 or more workers (maximum 10 when power is used or 20 when power is not used) called Directory Manufacturing Enterprises (DME).
(b) Establishments with 5 or less workers called Non-Directory Manufacturing Enterprises (NDME) and,
(c) Establishments with no hired workers – only family members engaged in productive activity called Own Account Manufacturing Enterprises (OAME), also called self-employment households.

National Sample Survey Organization (NSSO) Reports on non-factory sector (manufacturing and repairing) was organised by the CSO. Out of the various survey rounds conducted, the 45th Survey Round (1989) and the 51st Survey Round (1994) covering OAME, NDME and DME are relevant. Since, we have not used these data, we have not discussed further in details about the methodology used for coverage of the unorganised sector.

5.3.3 Unit of Enumeration (UE)

In the ASI, unit of enumeration (UE) is different for different type of activities. For manufacturing industries, UE is a factory; for repair services, UE is an undertaking; for electricity, gas and water supply undertakings, UE is a licensee and in the case of bidi and cigar industries, UE is an establishment. In case, two or more establishments are located
in the same state and pertain to the same industry group and belong to the same scheme (census or sample), owner of such units is required to furnish a single consolidated return, termed as 'Joint Return'. 'Joint Return' is a common feature in the case of bidi and cigar establishments, electricity and certain public sector undertakings.

5.3.4 The ASI Frame

List of registered factories maintained by the Chief Inspector of Factories (CIF) in each state and those maintained by licensing authorities in respect of bidi and cigar establishments and electricity undertakings constitute the base for the ASI frame, which is revised time and again by deletion of deregistered factories and inclusion of newly registered factories. In the initial phase, the frame was being revised once in every two years until 1981-82. Between 1982-83 and 1988-89, it was revised once in every four years. From 1989-90 onwards, the frame was revised once in every three years with inclusion of new registration in the existing frame every year. Regional offices of Field Operations Divisions (FOD) update the frame every year with the help of the offices of the CIF in the states.

Prior to 1983-84, contribution of non-existing units to various aggregates was taken as zero, but was used to be included while finalising the number of factories. From 1983-84, non-existing factories were excluded from tabulation.

The factories in the ASI frame are classified into two sectors, namely, the census sector and the sample sector. However, the modalities for undertaking either census or sample survey varied from time after time. Until 1986-87, all factories employing fifty or more workers with use of power, and those employing hundred or more workers without use of power, and all the electricity undertakings irrespective of their size of employment, as also bidi and cigar manufacturing establishments registered under the Bidi and Cigar Workers (Conditions of Employment) Act, 1966 were enumerated on a census basis. The factories other than the above categories, namely, factories employing ten to forty nine workers with the aid of power and factories employing twenty to ninety nine workers
without the aid of power were taken into account in the sample sector. The survey for the sample sector was made over a period of two years, meaning thereby that sampling was done on the basis of a 50 per cent probability sample— one set enumerated in one year and the other set in the next year\textsuperscript{44}.

From 1987-88, a new sampling method was adopted on the basis of the report submitted by a group headed by Prof. J. Roy of Indian Statistical Institute (ISI) and appointed by CSO in June, 1987 to evolve a ‘sampling design of the ASI’. Purpose was to reduce the workload and at the same time, ensure reliable estimates at the three digit level industry groups for each state.

Under this new sampling method, linkage of use or unuse of power with number of workers was done away with. All the factories employing hundred or more workers, all the electricity undertakings and all the factories located in twelve relatively less industrialised states and union territories were included in the census sector\textsuperscript{45}. Further, if the number of factories was found to be twenty or less at three digit level under a particular industry group, they were also included in the census sector. Remaining factories constituted the sample sector. The status of a factory either as a census sector or a sample sector did not get altered till the time the frame was revised on three yearly basis. Change in the number of employment during this period of three years was not considered for changing the status.

The sampling procedure adopted from the ASI 1987-88 was a unistage stratified one for the sample sector. The stratum in an industry group at three digit level of National Industrial Classification (NIC) 1987 was a state or union territory. For the purpose of sampling, the industry groups were divided into three categories: the first category

\textsuperscript{44} The sampling fraction was in fact one-sixth until 1967 and one-third thereafter until 1971. For the period 1973-74 to 1986-87, fifty per cent probability sampling was used.

\textsuperscript{45} All industrial units belonging to states/union territories, namely, Goa, Himachal Pradesh, Jammu & Kashmir, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Pondicherry, Manipur, Meghalaya, Nagaland, Tripura and Andaman & Nicobar Islands.
comprised of those industry groups (three digit level of NIC 87) where the number of factories is twenty or less. The second category which formed segment S1 comprised of those industry groups where the number of factories was between twenty one and sixty. The third category which formed segment S2 comprised of those industry groups where the number of factories was sixty one and above.

All the factories in each stratum of the first category were completely enumerated. With respect to the second category (segment S1), a sample of twenty units from each stratum was drawn. For sample survey of the third category (segment S2), one in every three was selected from each stratum. Sample of factories in segment S1 and S2 was selected in circular systematic manner with a random start. Method of uniform 50 per cent probability sampling adopted earlier for the second category was abolished and instead, a separate multiplier for each industry group (three digit level of NIC 87) within a state was determined and followed. For the third category (segment S2), it was uniformly taken as three.

More changes were made in the ASI 1997-98 regarding sampling design. All industrial units in the twelve industrially less developed states and union territories were put under census sector. The threshold limit for number of workers was increased to two hundred as per the ASI 1994-95 results. The scope of census frame was further widened to include 'significant industries'\(^{46}\) as per the ASI 1993-94 to 1995-96, and also, it includes all units belonging to public sector undertakings and electricity sector. Others were put under sample sector. In 1997-98, a new sampling design recommended by the technical group headed by Prof. Arijit Choudhury, ISI, Calcutta was adopted. Sample size for any industry was determined at four digit NIC level of 1998. The sample size for each state was then allocated in the proportion of industries in that state\(^ {47}\). In a summarised form,

\[ n = \frac{(2.58/p)^2 \times (C.V)^2}{0.99} \]

\(^{46}\) Significantly contributory units in terms of Net Value Added (NVA) from those units having less than two hundred workers.

\(^{47}\) According to the new sampling design, the sample size \(n\) for any industry at all-India level is determined first by assuming the central limit theorem applicable to the large population. For a suitable characteristic \(X\), say GVA for 100p% variation in the estimates the probability,

\[ \text{Prob.} \left\{ \frac{1}{n} \sum_{i=1}^{n} X_i - \mu \leq p \frac{X}{\sigma} \right\} = 0.99 \] is ensured. Accordingly it follows that

\[ n = \frac{(2.58/p)^2 \times (C.V)^2}{0.99} \]
we can thus say that manufacturing sectors are divided into two categories: registered and unregistered. Registered segment of manufacturing units is again subdivided into two groups – census sector and sample sector. While the ASI data covers both the census and sample sectors of manufacturing units, unregistered segments are covered by DME, NDME and OAME. Thus, the ASI does not cover mining and quarrying sectors, construction sectors and unregistered segments of manufacturing sector.

5.3.5 National Industrial Classification (NIC), 1970 and 1987

An important feature of the ASI is that it adheres to the NIC code of industrial classification. NIC code of classification, as one knows, evolved over time. Subsequent to the publication of the International Standard Industrial Classification (ISIC), 1968 by the United Nation Statistical Office, the system of industrial classification used for the ASI was changed from Indian Industrial Classification to an improved and expanded system, called the National Industrial Classification, 1970 (NIC 70) in 1973-74. The NIC 70 was followed from 1973-74 to 1988-89.

Subsequently, NIC 70 was replaced by NIC 1987 (NIC 87). In order to account for the changes and diversification taking place in the structure and organisation of industries, it was felt necessary to delete obsolete activities, incorporate new activities, and amalgamate unimportant activities with similar activities. In pursuance of this, a subcommittee submitted a report to the steering committee with the Director General of CSO as the Chairman. Based on the committee’s recommendation, the NIC 70 was revised and substituted by NIC 87. This had a definite bearing on the ASI classification.

Assuming \( p = 1/10 \) i.e., 10% and calculating C.V from ASI 1997-98, the sample size \( n \) for each industry (four digit level of NIC 1998) is determined.

The total sample size \( n_i \) for the \( i \)th state is then allocated in the proportion of the factories in the state.

\[
N_i = \frac{n_i \times N'}{N'}
\]

Thus, total sample size \( n_i \) in the \( i \)th state is \( n_i = \frac{n_i \times N'}{N'} \).

Where \( N' = \) Total no. of factories in the sample sector at all India level

\( N'_i = \) Total no. of factories in the sample sector at the \( i \)th state / U.T. level.

If \( N'_i < 8 \), then complete enumeration is done and for the case of \( N'_i > 8 \), a minimum value of 4 of the sample size is maintained. (Refer Annual Survey of Industries – 1998-99, Volume-1, Page XII and XIII)
The major one was the interchange of division 30 into 31, and 31 into 30. In NIC 70, under major industry group 30, 'manufacture of rubber, plastic, petroleum and coal products' was included, while under group 31, 'manufacture of chemicals and chemical products (except products of petroleum and coal)' was included. In NIC 87, 'manufacture of basic chemicals and chemical products (except products of petroleum and coal)' was included under group 30, while 'manufacture of rubber, plastic, petroleum and coal products, processing of nuclear fuels' was included under group 31.

In our study, we consider the period from 1981 to 1998 so that the period immediately preceding the economic reform could be taken into consideration along with a few more years after 1991, when the new economic policy was announced. Thus, for our relevant period, we encounter with two existing National Industrial Classification systems, namely, NIC 70 and NIC 87. Since the sources of data is CSO, we take it that they must have made necessary adjustment at the time of processing and giving input in CD ROM for publishing the same for the purpose of research. The data set that we use for this research does not, therefore, contain a problem of nonconformity in the referral classification category.

5.3.6 Strength, Weakness and Uses

The ASI constitutes a reasonably comprehensive set of data on the industrial sector in India. The data is collected and collated on the basis of census and sample survey of production unit and one can thus rely on the consistency of information available from the data set. In many respects, the data is superior to those from alternative sources like the RBI who publishes data based on studies of company's financials. The studies made by the RBI are based on sample of companies and do not provide factorywise information. Thus, the data available from the RBI are derived series whereas the ASI compiles the database after collecting them directly from the primary sources. Besides, we can get information statewise, rural-urbanwise and activitywise from the ASI data. Thus, the ASI data compared to the RBI data is more suitable for empirical analyses.
This, however, does not mean that the ASI data is devoid of any limitation. Firstly, the aggregation of annual data for different factories is based on the closing month of their respective accounting year. Until the year 1995, when the Income Tax Act was amended to maintain uniformity in the accounting period for business, annual figures of factories closing their accounts on any day between 1st April and 31st March of a year were clubbed together to form the annual data. Thus, the data available did not necessarily reflect the status as on the end of the financial year (i.e., April to March). Secondly, problem arising out of non-reporting by factories and inclusion of non-existing factories does not get properly addressed while compiling the data set.

Another lacuna which was pointed out is regarding the ASI frame itself. As Nagaraj (1999) observed, a sizeable number of factories are not even registered under the Factories Act, 1948 though they are qualified to do so. Nagaraj pointed out that only as much as 48 per cent of the establishments with ten or more workers were covered in 1980 and this ratio declined to 5 per cent in 1990. The coverage of the ASI thus seems to be incomplete and it may cause implications for the estimation of crucial variables.

Despite several limitations, the ASI is the principal source of data used by the CSO for publication of various important data in the National Accounts Statistics. Besides, every State Bureau of Economics and Statistics uses the data for similar purposes at the state level. Scholars and researchers also extensively use the ASI data to study various aspects of the manufacturing sector in India. Data available from other sources, namely, RBI, CMIE, etc., are not aggregated and as such, studies based on these data cannot give status of performance of industries at macro level; they can at best be used for studies at the disaggregate level.

5.4 PROWESS (CMIE) Database

Centre for Monitoring Indian Economy (CMIE) nowadays collects the company level data and organise them in a user-friendly way so that these data could be utilised for

empirical studies based on financial indicators. It contains a time series data with respect to about 10,000 Indian companies. Uniform referral points are maintained for each company so that further editing of the data would be unnecessary. The database provides financial statements, ratio analysis, fund flow statements, product profiles, returns and risks on the stock markets, etc. The database is complemented with powerful analytical software tools to enable extensive querying and research. Its wide application includes areas such as credit evaluation, security analysis, industry analysis, bench-marking, evaluation of competitiveness, feasibility studies, consulting, journalism and research. It is now being widely used by banks, research organisations, NGOs, consultancy firms, etc.

5.4.1 Strength, Weakness and Uses of PROWESS Database

PROWESS data is no doubt a ready source of data for company analysis. It provides all items of the balance sheet and profit and loss account in a standardised form. The flexibility to the use of various quantitative information contained in the items of the balance sheet is also maintained by defining the items precisely so that further disaggregation of the items of the balance sheet becomes possible.

PROWESS database, however, suffers from a major weakness. It is not based on complete enumeration of balance sheets of companies registered under Indian Companies Act. It is a sample study. The CMIE does not reveal how the sample is drawn out of the population. It appears that the database is maintained by convenience sampling. Again, the time series data in respect of companies often contain missing elements. As a result, it becomes difficult to develop a panel data out of the CMIE database. With respect to our area of study, there had been a major difficulty. The companies chosen by CMIE had mostly been healthy units. As such, we found very few sick companies from the list within industry group that we identified as bad performer at the macro level.

While preparing the panel data, we observed that the data was apparently collected in a perfunctory manner. As a result, consistent data for eighteen years was not available for all the companies. Thus, we had to restrict ourselves to successive ten years’ data for the companies chosen for our empirical analyses at the micro level.
The period of study with respect to micro data had, therefore, to be restricted within the period 1993 to 2004.

Even then, we had to utilise the PROWESS database for our micro level analyses because we did not have any other source of organized information on company level data. PROWESS database has limitations but one cannot afford to reject it for micro level study.

5.5 Reference Period

For macro level empirical analyses, the Annual Survey of Industries (ASI) data has been used for the period from 1981 to 1998. We have considered the time period upto 1998 for mainly two reasons. Firstly, we have considered NIC 87 for our analysis, which is at two digit level, whereas NIC 98 is available at five digit level. The concordance between these two needs a few approximations which we decided to avoid because we wanted to visualise the scenario in Indian industrial sector roughly for ten years before and after the enactment of the SICA, 1985 which came into operation from May, 1987.

For the micro study, time frame was ten years' period from 1995 to 2004 and not from 1981 to 1998. The reason is that we wanted to consider the performance of a select set of companies that belonged to such industries which had been 'good' or 'bad' performer during the period when the BIFR had been initiating its intervention following the SICA. The companies that remained sick even after intervention of the BIFR might be of special importance particularly when we study the factors that account for the probability of getting sick. The factors explaining the stronger probability of getting sick have to be captured in the context of current scenario. We, therefore, tried to concentrate on more recent period, which is why we considered a time frame that covers more recent years.
Chapter Five

5.6 Definitional Mismatch: Comparing ASI with PROWESS Database

For our study, it is necessary that we get a micro level data corresponding to the macro level information on industry groups clubbed as good performer and bad performer. For this, we need to develop definitional parity with respect to various indicators of performance for the data at macro and at the micro level. In this section, we take up this exercise. At the very outset, one may point out that the PROWESS data are collected from financial statements in the form of balance sheet and profit and loss account of the individual company. The industry level data that we get from the ASI are also prepared from factory/company level information, many of which are reflected in the financial statements of a company. Even then, a mismatch may develop because the way the ASI present the data does not strictly follow the language of a financial analyst; it tries to capture the information an economist usually uses for macro level analysis. Since we would utilise both the ASI and the PROWESS data, it is necessary that we find a definitional parity so that the issue can be addressed from a similar perspective.

We have considered six ratios as financial indicators for examining the financial health of Indian industries. These ratios are: Return on Invested Capital (ROIC), Operating Cash Flow to Invested Capital (OCF/IC), Interest Coverage Ratio (ICR), Debt Service Coverage Ratio (DSCR), Leverage Ratio (LR) and Working Capital Management Efficiency Ratio (WCMER). These ratios are normally used by financial analysts to assess the financial performance of a company. In order to maintain conformity and parity, we have utilised the ASI data for deriving these six ratios on the basis of the ASI-given categories such as profit, interest, invested capital, fixed capital, working capital and outstanding loan, etc. In order to do so, we have kept in mind the definition given by financial analysts for these ratios and chosen the synonymous data from the ASI in such a manner that would maintain definitional parity. We hold that all the above terms can be

49 PROFIT
In the ASI, profit is derived in the following manner:
Total Output
(-) Total Inputs (Materials Consumed, Fuels Consumed)
= Gross Value Added
(-) Depreciation
= Net Value Added
(-) Rent
(-) Interest
= Income
(-) Employees Cost (Total Emoluments inclusive of Salaries and Wages + Provident Fund and Others)
= Profit

TOTAL OUTPUT:
It comprises total ex-factory value of products and by-products manufactured as well as other receipts such as receipts from non-industrial services rendered to others, work done for others on material supplied by them, value of electricity produced and sold, sale value of goods sold in the same condition as purchased, addition in stock of semi-finished goods and own construction.

TOTAL INPUT:
It comprises total value of fuels, materials consumed as well as expenditures such as cost of contract and commission work done by others on materials supplied by the factory, cost of materials consumed for repair and maintenance of factory's fixed assets including cost of repairs and maintenance work done by other to the factory's fixed assets, inward freight and transport charges, rate and taxes (excluding income tax), postage, telephone and telex expenses, insurance charges, banking charges, cost of printing and stationery and purchase value of goods sold in the same condition as purchased.

MATERIALS CONSUMED:
It represents the total delivered value of all items of raw materials, components, chemicals, packing materials and stores which actually enter into the production process of the factory during the accounting year. It also includes the cost of all materials used for the construction of building, etc., for the factory's own use. It, however, excludes all intermediate products consumed during the accounting year. Intermediate products are those products, which are produced by the factory but are subject to further manufacturing.

FUELS CONSUMED:
It represents total purchase value of all items of fuels such as coal, liquified petroleum gas, petrol, diesel, electricity, lubricants, water, etc., consumed by the factory during the accounting year but excluding the items which directly enter into the manufacturing process.

DEPRECIATION:
Depreciation is consumption of fixed capital due to wear and tear and obsolescence during the accounting year and is taken as provided by the factory owner or is estimated on the basis of cost of installation and working life of the fixed assets.

RENT:
It represents the amount of royalty paid in the nature of rent for the use of the fixed assets in the factory.

INTEREST:
It includes all interest paid on factory account on loans, whether short term or long term, irrespective of the duration and the nature of agency from which the loan was taken. Interest paid to partners and proprietors on capital or loan are excluded.

SALARIES & WAGES:
Salaries & wages are defined to include all remuneration in monetary terms and also payable more or less regularly in each pay period to workers as compensation for work done during the accounting year. It includes (a) direct wages and salary (i.e., basic wages/salaries, payment of overtime, dearness, compensatory, house rent and other allowances); (b) remuneration for the period not worked (i.e., basic wages, salaries and allowances payable for leave period, paid holiday, lay-off payments and compensation for unemployment, if not paid from sources other than employers); (c) bonus and ex-gratia payment paid
defined, without losing the content of the term, in terms of the ASI data. Only point to be noted is that the relevant ASI terms have been interpreted differently in the language of the financial analysts. Thus, profit as conceived by financial analysts is excess of income (comprising of net sale value of production and other non operating income) over all expenses and cost (both variable and fixed whether paid or due) during a financial year.\(^{50}\)

both at regular and less frequent intervals (i.e., incentive bonuses, good attendance bonuses, productive bonuses, profit sharing bonuses, festival or year-end bonuses etc.). It excludes lay-off payments which are made from trust or other special funds set up exclusively for this purpose, i.e., payments not made by the employer. It also excludes imputed value of benefits in kind, employer’s contribution to old age benefits and other social security charges, direct expenditure on maternity benefits, crèches and other group benefits. Travelling and other expenditure incurred for business purposes and reimbursed by the employer are excluded. The wages are expressed in terms of gross value i.e., before deduction for fines, damages, taxes, provident fund, employee’s state insurance contribution, etc.

**INVESTED CAPITAL:**
Invested capital is the total of fixed capital and physical working capital.

**FIXED CAPITAL:**
Fixed capital represents the depreciated value of fixed assets owned by the factory as on the closing day of the accounting year. Fixed assets are those which have a normal productive life of more than one year. Fixed capital includes land including lease-hold land, building, plant and machinery, furniture and fixtures, transport equipment, water system and roadways and other fixed assets such as hospitals, schools, etc., used for the benefit of factory personnel.

**PHYSICAL WORKING CAPITAL:**
Physical working capital is total inventories of raw materials and components, fuels and lubricants, spares, stores and other, semi-finished goods and finished goods as on the closing day of the accounting year. However, it does not include the stock of the materials, fuels, stores, etc., supplied by others to the factory for processing and finished goods processed by the factory from raw materials supplied by others.

**WORKING CAPITAL:**
Working capital is the sum total of the physical working capital as already defined above and the cash deposits in hand and at bank and the net balance of receivables over amounts payable at the end of the accounting year. Working capital, however, excludes unused overdraft facility, fixed deposits, irrespective of duration, advances for acquisition of fixed assets, loans and advances by proprietors and partners irrespective of their purpose and duration, long-term loans including interest thereon and investments.

**OUTSTANDING LOAN:**
Outstanding loan represents all loans whether short term or long term, whether interest bearing or not, outstanding according to the books of the factory as on the closing day of the accounting year.

\(^{50}\) In terms of section 2(17) of the Companies Act, ‘Financial Year’ means, in relation to any body corporate, the period in respect of which any profit and loss account of the body corporate laid before it in annual general meeting is made up, whether that period is a year or not;

Provided that, in relation to an insurance company, ‘financial year’ shall mean the calendar year referred in sub-section (1) of section 11 of the Insurance Act, 1938 (4 of 1938)
Chapter Five

Profit is again categorised as gross profit\textsuperscript{51}, profit before tax\textsuperscript{52} and net profit\textsuperscript{53} (profit after tax).

In the profit and loss account statement of a company, interest includes all interest paid on account of short term and long term loans including interest paid to the promoters of the company for loans given to the company. In the company level balance sheet, there is no term as ‘invested capital’. Synonymous term in the balance sheet of a company is ‘total assets’. We have thus conceptualised ‘Return on Invested Capital’ (ROIC) as ‘Return on Investment’ (ROI) as defined in the language of the financial analysts. Thus, we have defined ROIC as \((\text{profit + interest})/\text{invested capital}\) in order to keep parity with the definition of ROI as \((\text{net profit + interest})/\text{total assets}\) as given by the financial analysts. Similarly, ‘Operating Cash Flow to Invested Capital’ (OCF/IC) has been taken as same as ‘Operating Cash Flow to Total Assets’ to maintain definitional parity and the same has been derived as \((\text{profit + interest + depreciation})/\text{invested capital}\). In the same way, Interest Coverage Ratio (ICR) has been derived from the ASI data as \((\text{profit + interest})/\text{interest}\) in order to have same interpretation as understood by the financial analysts. Leverage Ratio (LR) is defined by financial analysts as a ratio between net worth and outstanding loan of a company. While net worth has been defined in the Companies Act\textsuperscript{54}, the same term does neither feature in the ASI nor is it

\textsuperscript{51} GROSS PROFIT:
Gross profit is \([\text{sales} - \text{cost of goods sold}]\). Cost of goods sold is derived as ‘Raw materials consumed \([\text{opening stock of raw materials} + \text{purchases of raw materials} - \text{closing stock of raw materials}]\) + Other manufacturing expenses \([\text{wages} + \text{power and fuel consumed} + \text{repairs and maintenance} + \text{depreciation} + \text{consumable} + \text{factory rent} + \text{factory expenses}]\) + Opening stocks-in-process - Closing stocks-in-process + Opening stocks of finished goods - Closing stocks of finished goods.

\textsuperscript{52} PROFIT BEFORE TAX
Profit before tax is equal to gross profit \(-\) operating expenses (general and administrative expenses, selling & distribution expenses) \(-\) interest \(+\) other non-operating income \(-\) non-operating expenses.

\textsuperscript{53} NET PROFIT AFTER TAX
Net profit after tax is equal to profit before tax \(-\) provisions for income tax.

\textsuperscript{54} In terms of Section 2(29A) of the Companies Act, ‘net worth’ means the sum total of the paid-up capital and free reserves after deducting the provisions or expenses as may be prescribed.

Explanation:- For the purposes of the clause, ‘free reserves’ means all reserves created out of the profits and share premium account but does not include reserves created out of revaluation of assets, write back of depreciation provisions and amalgamation.
used by an economist as a tool for measuring performance of an industry sector at the macro level. In order to maintain conceptual parity, we have considered 'net worth' as almost equivalent to (fixed capital + working capital – outstanding loan) in respect of industry level data\textsuperscript{55}.

In the balance sheet of a company, there is no term as 'fixed capital'. This term is, however, almost synonymous to 'net block' (gross fixed assets – accumulated depreciation + capital work-in-progress) which appears in the company's balance sheet. Again, definition given by the ASI for 'working capital' is different from the definition given by the financial analysts for the same term. 'Working capital' as has been defined in the ASI is almost equivalent to 'net working capital' or 'net current assets' (current assets – current liabilities) of a company. If we stretch our conceptual interpretation, total of fixed capital and working capital minus outstanding loan shall be almost equivalent to 'net worth' as has been defined in the Companies Act. We thus conceptualise the Leverage Ratio (LR) as (fixed capital + working capital – outstanding loan)/outstanding loan. Debt Service Coverage Ratio (DSCR) is considered by the financial analysts as an important indicator to judge the debt servicing capacity of a company. In order to maintain the conceptual parity, we have derived DSCR from the ASI data as (profit + interest + depreciation)/(interest paid + 20 per cent of outstanding loan). Financial analysts consider that term loan\textsuperscript{56} taken by a company from the banks/financial institutions should be repaid preferably within a period of five years. Hence, we have taken 20 per cent of outstanding loan in the denominator for a yearly measure of the debt servicing capacity. In the language of the financial analysts, Working Capital

\textsuperscript{55} In the language of a financial analyst, total assets of a company comprise of net block (gross fixed assets minus accumulated depreciation), investments and current assets. Liabilities of a company comprise of net worth or share holders fund, term loan and current liabilities. Again, according to the accounting equation, assets are equal to liabilities. Thus, net worth of a company is equal to total assets minus total of term loan and current liabilities. Keeping this interpretation of the financial analysts and definition given in the ASI for various items, we find that the sum total of fixed capital and working capital of an industry sector is equivalent to total assets minus current liabilities. If we deduct outstanding loan from this figure, what we get is essentially net worth of an industry sector or an individual industry.

\textsuperscript{56} Term loans are those loans which are obtained by a company on long term basis for long term applications and these are required to be repaid over a period of years. Unlike current liabilities, term loan is not payable on demand.
Management Efficiency Ratio (WCMER) indicates efficiency of a firm in regard to management of assets and liabilities. For macro level analyses, we have thus derived WCMER as a ratio between working capital and invested capital. In this way, we have made an attempt to remove the definitional mismatch to the extent it is required for the purpose of our empirical study. We submit that the way we have developed the matching between the macro (the ASI data) and the micro (the PROWESS data) relies heavily on some basic concepts that the economists are used to follow in analysing the economic behaviour of an entity. However, the concept did in no way distort the conceptual framework of a financial analyst.

5.7 Operationalising the Data for Empirical Analysis

The ASI reports variables in nominal value terms, that is, at current prices. Any significant analytical work would, therefore, require deflating these variables in order to account for change in price. Wholesale Price Index (WPI) series is the reliable tool to normalise the data set. We have deflated all the variables by WPI and used Consumer Price Index (CPI) only to deflate employees cost. Numbers are expressed in thousands and amounts have been shown in rupees lakhs.

There are, however, certain limitations while directly using WPI as the deflator. As for classification of industries, ASI follows the NIC, which is based on nature of activities. These activities range from manufacturing to processing/repairing services, whereas WPI is constructed with a view to capturing price movements based on nature of commodities and final demand. In a nutshell, while the ASI classification is based on activities, the WPI is based on nature of commodities. Identifying the nature of commodity grouped under the ASI activity based classification is difficult, if not impossible. This problem is more severe at three digit level. At best, one can approximate commodities based on the nature of economic activities which prompted us to use the WPI only (except for employee’s compensation). This is one of the limitations of this study.
Chapter Five

We, in our analysis, instead of using a separate and relevant price deflator for each separate industry code, use the price deflator for all commodities in general. We have deflated the raw ASI data by the WPI with 1982 as the base year. We have followed this procedure keeping in mind that while in a number of industries, their respective commodities could be identified, there is no single commodity for a few industries. Further, for the processing/servicing based industries, the WPI series do not exist because they do not form a part of the final demand.

With respect to company level data at the micro level, the balance sheet and profit and loss account items are considered from the PROWESS data for our selected set of hundred companies. Each of these items is normalised first by total assets and then by total income. These normalised ratios are used for arriving at an appropriate model that could predict the health of Indian manufacturing industries much before they reach a state of severe sickness.

5.8 Summary and Conclusion

The empirical work that we propose to perform needs two sets of data - a set at the industry level and the other set at the company level. For the industry level data, we refer to the ASI data and for company level data, we rely on the PROWESS database. The time period for macro level analyses has been considered from 1981 to 1998. We have considered NIC 87 for our analyses, which is at two digit level. NIC 98 is at five digit level. We have considered the above time period for two reasons: First, we decided to avoid a few approximations which were needed to have concordance between NIC 87 and NIC 98; Second, we wanted to visualise the scenario in Indian industrial sectors roughly for ten years before and after the enactment of the SICA, which came into operation from May, 1987. For the micro study, time frame has been considered from 1995 to 2004. The reason is that we wanted to consider the performance of a select set of companies that belonged to such industries which had been 'good' or 'bad' performer during the period when the BIFR had been initiating its intervention following the SICA. For our study, it is necessary to get a micro level data corresponding to the macro level
information on industry groups. For this purpose, we have developed a definitional parity with respect to various indicators of performance for the data at the macro and at the micro level so that the issue can be addressed from the perspective of both economists and financial analysts. We have considered six ratios as financial indicators for examining the financial health of Indian industries. These ratios are: Return on Invested Capital (ROIC), Operating Cash Flow to Invested Capital (OCF/IC), Interest Coverage Ratio (ICR), Debt Service Coverage Ratio (DSCR), Leverage Ratio (LR) and Working Capital Management Efficiency Ratio (WCMER). These ratios are normally used by the financial analysts to assess the financial performance of a company. In order to maintain conformity and parity, we have utilised the ASI data for deriving these six ratios on the basis of the ASI – given categories, such as profit, interest, invested capital, fixed capital, working capital and outstanding loan etc. We have kept in mind the definition given by the financial analysts for these ratios and chosen the synonymous data from the ASI in such a manner that would maintain definitional parity. The way we have developed the matching between the macro (the ASI data) and the micro (the PROWESS data) relies heavily on some basic concepts that the economists are used to follow in analysing the economic behaviour of an entity without distorting in any way the conceptual framework of the financial analysts. We have normalised the ASI data set by deflating all the variables by WPI and used CPI only to deflate employees' cost. Dividing each item first by total assets and then by total income normalizes balance sheet and profit and loss account items considered from the PROWESS database. We consider these normalised ASI time series data for empirical analyses of organised industries at the macro level with a view to get an idea about their behavioural pattern and to see how the different industries are similar or dissimilar to one another in terms of the six derived ratios used as parameters. We perform this exercise in the next Chapter.
References

- Centre for Monitoring the Indian Economy (CMIE), *Economic Intelligence Service, Corporate Sector*, Various Years.