CHAPTER 2
RESEARCH PROBLEM AND METHODOLOGY

2.1 Research Problem

The development of petrochemical industry at all India level has already been discussed in the previous chapter. From this analysis it is clear that petrochemical industry is of critical importance in the modern industrialization process of the country. The present study attempts to analyse various economic aspects of the development of the petrochemical industry in the country. The economic aspects are computed highlighting their significance and impact on the growth of the economy. The performance indicators like production, investments and profitability are studied in detail. In the field of petrochemical industry it is noticed that demand is always more than supply especially the demand for polymers which is the input for plastic processing units. Firstly, in spite of the increase in production, the demand for its products is still rising. Hence a study is required to look into the matter so as to increase our existing production by using different technological skills in the light of production performance criteria. Secondly, the industry, grows at a faster rate due to rise in investment. Especially in the field of petrochemicals a high rate of growth can induce heavy investments. It gives one of the highest return on the rupee invested. Therefore, it needs to be investigated from
the point of view of investment criteria. Thirdly, a popularly used criterion in evaluating the performance of an industry is profits and profitability. The arguments commonly advanced for using profits as a measure of performance is that high levels of profitability especially in petrochemical industry like IPCL have contributed to its high rate of growth. In this study all the three indicators of performance like production, investment and profitability in the petrochemical industry are adopted for research analysis. The study also tries to identify and explain the implications of the working of this industry due to its significance as a key industry. It is essential to look into its impact in the field of economic growth and development of the country.

2.2 Queries related to Research

Specifically the present study attempts to deal with following queries:

i) What are the various economic aspects that can effect growth and development of the industry?

ii) What are the steps required to study the parameters that determine production function and returns to scale in this industry?

iii) What determines investment in Indian petrochemical industry? Is there any significant difference in the working of the unit with heavy investment (like IPCL)
and units with less investment?

iv) What determines profits and profitability in this industry?

Subject Matter of Study

In this study various economic aspects are highlighted in order to judge the performance of the industry. However, it should be noted that there is no measuring rod of performance indicators as it differs from industry to industry looking to its importance. Therefore, we have tried to highlight most of the economic aspects through charts and interpretations and thereby evaluating the overall performance as the industry.

Further the problem chosen namely production performance is basic and most important. This industry has a tremendous scope of expansion as stated before. When the demand exceeds supply, what are the factors that can increase production without increasing capacity? We have looked into returns to scale, laboured productivity and the impact of the efficiency on the industry when more doses of technology are injected into the existing production capacity.

The study of investment behaviour is analysed to understand the obstacles that come in the way of the growth of this industry. Investment in fixed assets and in plant and machinery explains expansion in production. Investments
can be for the replacement of depreciated assets which would in turn lead to more efficient production when there is a large gap between demand and supply as that found in the case of petrochemical industry. A clear cut picture should be created so as to analyse determinants of capacity expansion in a particular industry. In the case of investment behaviour it helps to enquire whether there exists any difference in the efficiency levels of the 'units which are investing heavily' and the 'units with comparatively less investment' eg. IPCL has undergone very heavy investment whereas petrochemical group at all India level does not have units with that heavy investments. This can also lead to important policy implications which can help this industry to get organised and improved infrastructural facilities provided for the growth of the industry.

Profits are the most attractive aspects of any industry. Hence its study becomes more necessary. It can be rightly said that profits are the inspiring factor in investment behaviour. Hence looking at the importance of profitability in an industry, a detailed analysis is carried out and is related to the investment behaviour. Profits contribute an effective guideline for investment. They also contribute to the availability of internally generated resources. This helps in the expansion of the industry if the amount earned is reinvested. Hence, there is need to
look into the question whether profits are going to be a guiding factor in investment and expansion process or not. The idea for providing a significant expansion in public sector is to fulfil the raw material requirement for small and medium existing units scattered in different parts of the country, wherever the demand persists. Hence profit maximisation should not be the aim. Therefore, a penetration is required to find out the extent to which corporate sector in petrochemical industry fulfils the public needs.

2.3 Methodological Aspects of the Study

The study is related to industry as the whole but to understand the working of industry more closely a case study of a selected industrial unit is undertaken. As IPCL is the largest manufacturer of petrochemical products it has been selected for intensive analysis. Wherever necessary, a comparative analysis of IPCL Unit with the industry as a whole is also undertaken. To put the analysis in proper perspective, a brief historical description of IPCL is provided in chapter three. The economic analysis of the industry is organised in terms of following components. The financial and economic performance of the industry in terms of ratio analysis and growth rates is given in chapter four.

a) Ratio-analysis: Ratio analysis of various economic
aspects has been made with the help of time series data for the last ten years. The performance indicators were judged by depicting them in tables and through interpretations.

b) Growth Rates: Semi-logarithematic regressions are worked out to estimate growth rates.

Three major problems concerning production, investment behaviour and profitability are analysed through estimation of functional relationships using econometric methods.

i) Production function analysis (Chapter-5)

Production function deals with labour productivity and capital intensity with various returns to scale and its impact on the industry on the whole.

ii) Investment behaviour (Chapter-6)

Study of investment behaviour tries to explain the various determinants of investment behaviour in this industry, like investment in fixed assets and investment in plant and machinery.

iii) Profitability (Chapter-7)

Factors that govern profitability are highlighted, as it is one of the most important indicators of performance. Profitability is taken as a ratio of net profits to total assets.

The econometric models on each of the above aspects are
developed on the basis of their suitability and usage in earlier studies. These are then tested for their empirical validity with the help of the framework of multiple regression analysis. The estimation is done by ordinary least square procedure. In this procedure a single equation model is mathematically specified in which the dependent variable is explained by one or more independent variables. In all the models that have been specified there are several independent variables. The existence of multicollinearity can sometimes render the estimates imprecise, hence it becomes difficult to disentangle the relative effects of various independent variables. The check of multicollinearity is provided by inter-correlation between the independent variables. Generally, if the correlation between any two independent variables is not significant then it is regarded that the problem of multicollinearity is not serious.

The check for the existence of autocorrelation is also performed in the study. The consequences of applying least squares estimation procedure to an auto-correlated data is that estimates so derived are underestimates and are inefficient estimates. The test for this is provided by Durbin-Watson (D.W) statistics. D.W. statistics is used to test the presence of first order serial auto-correlation.
2.4 **Data and Data Sources**

For this study, the information is depicted from the published accounts (annual reports and balance sheets) of the company during the last decade or so. Along with this, certain other documents which have been published separately are also relied upon. In the case of petrochemical group at all India level, data is extracted from annual survey of industries and through other published sources.

2.5 **Definitions/Measurement of Variables**

**Investment**: For the purpose of this study, investment is defined as the difference between gross blocks of two successive periods. This represents investment in fixed assets which includes plant and machinery, land and buildings and others. We have also considered investment in plant and machinery alone.

**Retained cash flow**: We define the retained cash flow as the profits net of taxes gross of current depreciation but not of current dividends.

**Flow of net debt**: Flow of net debt which represents external finance is defined as the difference between net stock of debt at the beginning and at the end of the year. It also includes debentures, long-term borrowing for working capital and unsecured loans and deposits.

**Profitability**: We usually have two definitions for
profitability, first one being profitability as a ratio of net profits to sales and second one being profitability as the ratio of net profits to total assets. Second definition is accepted in this study.

Net working capital: Net working capital is defined as difference between current assets and current liabilities. Current assets constitute cash and bank balances, inventory, accounts receivables and other miscellaneous items, while current liabilities constitute items like loans and advances, sundry creditors and provisions etc.

Capacity utilisation ratio: Capacity utilisation is defined as ratio of

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\frac{\text{Annual production}}{\text{Installed capacity}} \times 100
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Annual production and installed capacity is measured in terms of millions of tonnes.

All the variables defined above except capacity utilization, are in rupee terms at current prices. Capacity utilization is in terms of percentage.